Chemical Age

SCI CARBON and GRAPHITE CONFERENCE
(page 555)

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INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

continued on page 54

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CHEMICAL AGE

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FINLAND IN 1956

TRENDS in the economic situation in Finland in 1956 are presented in the recently published Yearbook of the Bank of Finland. From this general review it is apparent that in 1956 there was a worsening in the economic life of the country and that the situation, in a still more aggravated form, has continued in the present year. Indeed, the position is such that it has prompted a political-economic crisis, relief from which has yet to occur.

Despite the economic situation, however, the Finnish chemical and allied industries appear to be progressing along favourable lines. In fact, 1956 is considered to have been a notable one in the development of the sulphuric acid and fertiliser industries in Finland. The new Petersen plant in Harjovalta has increased production of sulphuric acid so as to satisfy the whole domestic consumption; thus the production increased from 132,970 tons in 1955 to 153,467 tons last year. Due to this, output of phosphate fertilisers correspondingly showed an increase of 69,064 tons as compared with the previous year and totalled 330,097 tons. The present production of phosphate fertilisers is sufficient to supply the country's home needs and makes the country self-supporting in this respect.

Consumption of fertilisers is steadily increasing in Finland and in 1956, totalled 41,484 tons of nitrogen (N), 84,011 tons of phosphoric acid (P_2O_5) and 50,128 tons of potassium (K_2O). Mixed fertilisers last year formed one-third of the total consumption of fertilisers, production reaching 223,928 tons, as against 208,151 tons in the previous year.

Reports on the production of the nitrogen fixation industry show that, in spite of the general strike last year, production was 16,669 tons (16,636 tons in 1955). Production of nitro-chalk also showed an increase from 54,998 to 58,966 tons. Output of technical ammonia, however, was halved (1,650 tons compared with 3,180 tons in 1955) due to production ceasing in Helsinki during the general strike. Figures for Finland's electrochemical industry for production as well as consumption, taking into consideration the general strike, were nearly the same as 1955. Due to an increase in caustic soda production (36,730 tons compared with 34,730 tons in 1955) imports were reduced considerably (from 3,275 tons in 1955 to 385 tons last year). The exceptionally dry summer affected water-power generation and hence chlorine production figures (31,340 tons in 1956 compared with 30,900 tons in 1955), so that 461 tons were imported. An improvement occurred later in the year. Because of low import prices for alkali-phosphate fertilisers, there was a low production rate (446 tons); imports totalled 4,466 tons. Carbide production last year at 8,844 tons was a little lower than the previous year (9,811 tons).

Finland's chemical wood pulp production rose only slightly, again because of the general strike. The sulphite alcohol industry has been running fairly well, and production has amounted to 22,211 tons. It is noted that sulphate by-products reached new production records: 5,925 tons of raw turpentine, 4,865 tons of which were refined, 22,303 tons raw tall oil, of which 15,732 tons were distilled, and production of tall oil pitch was 3,281 tons.

Progress in Finland's pharmaceutical industry was favourable in spite of the strike, and the critical economic and political situation. Compared with 1955 total sales increased by 10 per cent, and amounted to 2,660 million

marks. (£3 million.) Output also increased by nearly 10 per cent. Substantial modernisation was completed during the year both in the production and the packaging lines, although towards the end of the year licensing difficulties seriously reduced the import of new machinery for the industry. Increases in prices of raw materials, and particularly for sugar, pushed prices of medical products up by two to three per cent.

The raw material situation in the Finnish plastics industry is reported as being very difficult, due to licensing and the importing of new machinery which is practically at a standstill. Plastics manufactured in Finland at the present time are: Phenol-formaldehyde (568 tons compared with 610 tons in 1955); urea-formaldehyde, for which no figure is available for 1956 (24 tons in 1955); melamine-formaldehyde, 12 tons in 1956 (25 tons in 1955); and casein-formaldehyde, 106 tons (84 tons in 1955). Great Britain provided about 50 per cent of Finland's imported plastics materials and Western Germany nearly 15 per cent.

Partly as a result of the general strike and partly because of the Suez crisis, the viscose-fibre industry in Finland in 1956 was run at a loss. Production of viscose staple fibre increased by 50 tons and totalled 15,997 tons. The total exported amounted to 11,892 tons, which covers about 73 per cent of the total sales. Export was directed mainly to Rumania, Poland and the Soviet Union. Due to the increasing competition from these countries' own products, prices have fallen by four to nine per cent compared with 1955 prices.

Production of viscose rayon filament yarn was similar to that of 1955 (1,010 tons as against 980 tons in 1955), that of viscose rayon cord increased by 23 per cent, but that of viscose sponge decreased by 16.5 per cent, due, it is stated, to the general strike.

Throughout the chemical and allied industries in Finland in 1956 up to the present, the trend is progressive. New plants are coming into operation, modernisation of existing ones is being undertaken and also of production facilities. Production in nearly every section was maintained at the 1955 level or increased in 1956 despite the difficulties imposed by the country's general strike and the Suez crisis.

UK SYNTHESIS GAS RESEARCH

CONSIDERATION is being given to the longer-term aspects of fuel economy in this country. This is apparent from the report of the Fuel Research Board for 1956, an account of which is to be found on p. 553 of this issue. It is pointed out that the generation of electricity from nuclear energy should reach a scale at which such electricity will replace other fuels for the production of heat and power for many purposes and thus reduce the overall demand for coal. It is hoped that when this stage is realised, it may then be practicable, provided economic developments take place, to make oil from coal and its products, so reducing the country's dependence on imported oil, if this should be necessary or desirable.

Following on the discoveries of Fischer and Tropsch in Germany before the war, the Fuel Research Station has carried out laboratory and small unit scale investigations on the synthesis of oil from mixtures of carbon monoxide and hydrogen derived from coal. Compared with the price of imported petroleum the process was not competitive. Despite this, however, Germany erected full-scale plant before 1940, having a total capacity of about 750,000 tons of oil a year, which was operated throughout the 1939–45 war, thus reducing that country's dependence on imported oil.

It appears that the Fuel Research Station have consistently recommended that experimental work on the Fischer-Tropsch process and its various modifications be continued, firstly, as an insurance for the future in case of difficulties in obtaining petroleum oils, secondly, because of the possibility of applying it economically in certain areas of the Commonwealth and Colonial territories where coal can be produced economically, thirdly, because of its promise as a method of making chemicals, and fourthly, because research may lead to improved and less costly methods of synthesis.

A particular point of interest is that since 1945, the Station has been consulted by several organisations about the commercial possibilities of the process in overseas territories.

Research at the Station, in Germany and the US has indicated recently that the synthesis process can be improved. Major cost at present is the production of the synthesis gas using the proved techniques. There are indications, however, from gasification investigations in the UK and elsewhere and consideration of the results by the Fuel Research Station and the Chief Scientist's Division of the Ministry of Fuel and Power that the cost of making synthesis gas and of applying the process can be greatly reduced.

It is learned that because of these recent developments and the prospect of improvements in the process, the Ministry of Fuel and Power have placed research and development contracts with industry. The Fuel Research Board also recommend that there should be some increase in the work on the Fischer-Tropsch process, and close collaboration is being maintained between the Station and the Ministry.

SHOCK TREATMENT

CHEMICAL manufacturers have now had time to take stock of the Chancellor's shock treatment in raising the Bank Rate to 7 per cent. There can be little doubt that the action came late in the day and that it will have to be backed with other measures.

Until now the brake has been applied much too gently to achieve the Chancellor's purpose; only perhaps if the new rate is backed by full Governmental control of bank loans ruthlessly applied, is it likely to have the desired effect.

It seems unlikely that companies will be greatly disturbed by 7 or 8 per cent. Bank interest is a charge against profits. After allowing for the saving of income tax, distributed and undistributed profits tax, the effective rate becomes around 3½ per cent—a rate that will not deter borrowers for long. But it seems that plant coming into production in 1957–58 will not be fully employed; certainly it is the Chancellor's intention that there should be a cut-back in production and inevitably a higher unemployment 'float'.

Apart from an intended brake on production, the chemical industry is likely to be seriously hit by the effect of the new Bank Rate on sales. As raw material suppliers to so many other industries, chemical production is sensitive to recessions, however minor, in consumer industries. That much was obvious during the motor industry slump of a year ago.

There can be no denying that restriction, however much it is deplored, is inevitable. The vital need for a long-term expansion of the economy must wait until the present state of unbalance is corrected. Once the economy has been restored, industry will be able to go forward again. Already the Government's resolution has improved the position of sterling. The next step should be a paring of the liquid resources from which wage increases are paid. In the chemical industry, of course, wage increases have so far largely been covered by increased productivity.

If disinflation is to be successful, the Government must drastically prune spending, particularly by the nationalised industries. The time is overdue for a revision of buying policies. Individual companies would be wise to give thought during the coming months to means of improving productivity that can be implemented when the present short-term economic measures have passed. The full co-operation of the unions should be sought, for in the long term there can be no future for an economy in which productivity rises are outstripped by wage claims. Planning of this nature will pay dividends in the future.

CAPACITY DOUBLED AT WORLD'S ONLY CATALYST PLANT

New Extensions at Clitheroe Plant

NEW extensions to what is believed to be the world's only self-contained catalyst factory, were opened by Lord Clitheroe on Monday. The extensions, carried out over a period of three years, have transformed the Clitheroe, Lancs, plant of the ICI Billingham division, into what is virtually a new plant. Capacity has been doubled and a high degree of process control and automation has also been achieved.

The plant is capable of producing a range of 20 'standard' catalysts, based on iron oxides, cobalt-molybdenum, vanadium pentoxide, nickel and copper oxides, etc. Capacity is sufficient to supply ICI's needs for catalysts in the manufacture of ammonia, petrol by creosote hydrogenation, methanol, alcohols for plasticisers, acetone, amines, nylon, Terylene, phthalic anhydride, sulphuric acid, etc. A rapidly growing trade services chemical (particularly ammonia fertilisers), petrochemical paint and plastics manufacturers and the oil industry at home and overseas. Largest single export market is the US.

A CHEMICAL AGE staff reporter last week visited the factory and inspected the modern high-speed methods of catalyst production, the result of more than 30 years' experience by the Billingham division. Formerly each of the division's plants made its own catalysts. At the Government's request during the war, ICI designed and erected the Clitheroe factory and supervised its operation.

Gradual Transfer

During and since the war, the manufacture of catalysts in the Billingham division was gradually transferred to the Clitheroe factory, which was purchased by ICI in 1950. With a site area of some seven acres, and a labour force of just over 200 men, of whom some 70 are directly employed in process operations, the factory is the smallest of the external plants of the Billingham division.

Despite spectacular results from the application of work study it was realised in 1954 that ICI catalyst demands would soon overtake existing capacity and it was decided largely to rebuild the factory, doubling its capacity.

The result has been a new factory now in full operation in which modern instrumentation and automatic control play a considerable part. The product list includes catalysts suitable for the following processes: steam/hydrocarbon reforming; carbon monoxide removal (shift reaction); methanation (removal of CO traces); sulphur removal; hydrogenation; dehydrogenation; hydrocarbon oxidation, etc.

Operating round the clock for seven days a week, the present factory consists essentially of three process buildings, plus stores, services and amenity buildings. The process sections are: pasting section for wet processing; oven section for drying, decomposition, calcination, etc.; and pelleting section for dry processing. Most of the equipment items are general purpose units enabling several catalysts to be made at any one time. The range of 'standard' catalysts is made in production campaigns lasting from a few weeks to several months.

A batch of Manesty machines in use for pelleting catalysts

The visitor to Clitheroe is impressed by the tidiness, cleanliness and general efficiency that are evident in every department. Despite the difficulties, work study has been successfully applied to what is essentially a batch production process, as well as to maintenance and clerical work. Competition within the plant and with other ICI plants helps maintain a high degree of 'good housekeeping', keeps the accident rate low (so far this year, not a single hour has been lost by accidents), and keeps voluntary fire fighting and first aid teams on their toes. There are also training courses for all process operators.

The first section visited by CHEMICAL AGE was the four-storey pasting building, the ground floor of which contains reaction vessels. Stock solutions are prepared from metals or salts, which can be maintained at controlled temperatures if necessary. Preset volumes of these solutions are passed to precipitation vessels at controlled rates and temperatures and after a set period of time, suspended precipitates are pumped to pressure filters, where they are subsequently washed at controlled rates and temperatures for predetermined periods. All proportions can be preset and then controlled either automatically or by hand from one of two control panels. These are shortly to be switched to fully automatic time-cycle control.

Three new continuous band drying ovens and one special purpose continuous calcining oven have been installed in the oven section. Most of the ovens are gas fired and are fitted with enclosed discharge systems to eliminate dust hazards, since some dusts are toxic. Filtered solids are dried at temperatures of between 100°-200°C., and in some cases at about 400°C.

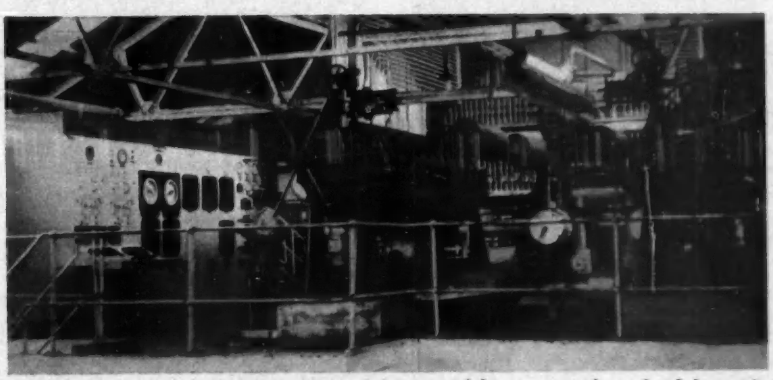
Gravity Flow

Gravity flow of materials is used wherever possible in the pelleting section. Intermediate products from the oven section or sometimes raw materials from store are intermittently dispensed from storage hoppers in controlled amounts to crushing, mixing, granulating, pelleting or briquetting machines as required. Travelling weigh hoppers by Avery are extensively used.

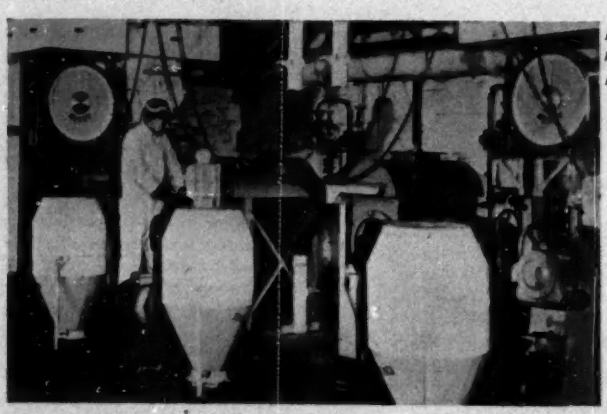
High-speed pelleting is essential since in commercial plants a charge of catalyst can contain over 100 million pellets. Pellet strength is equally important to give a long catalyst life and high pelleting pressures are employed. Most of the high-speed rotary machines for cylindrical pellets can produce up to 80,000 small pellets an hour; some can achieve 250,000 pellets an hour.

In the preparation of iron-oxide catalysts, heavy-duty West German Kilian pelleting machines are used. For most of the range, however, the Manesty high-speed tabletting machine is in use.

Iron oxide is a major constituent of some catalysts, but as it is detrimental to many other metal oxide catalysts the pelleting section is laid out to process 'iron-bearing' and 'iron-free' catalysts in separate compartments to avoid cross contamination arising from catalyst dusts. A well-planned dust control system connects all operations from which there is likely to be any dust emission either to a



The filtration section at Clitheroe. On the left is one of the two control panels of the pasting section



Preparation of intermediate materials prior to catalyst pelleting

general extraction system or to individual dust collecting units if the dusts are capable of re-use or are worth separate recovery.

Catalysts are expensive products with values in some cases of more than £1 per lb. and mechanical losses are kept to a minimum at all stages, even if the dusts, etc., are not hazardous. Dusts from the iron oxide and vanadium pentoxide catalyst processes are recovered separately.

A third compartment of the pelleting section contains a self-contained plant devoted to the manufacture of olefine polymerisation catalyst, a product made under licence from Universal Oil Products, US, and sold by ICI to UOP licensees operating outside the US.

The Clitheroe control laboratory like the plant also operates seven days a week. While under the direct control of Mr. D. M. Grudgings, Clitheroe works manager, the laboratory is backed by the full experience and resources of the analytical section of the Billingham research department to ensure that the best standard methods of analysis are always in use. Final product acceptance, involving the sampling of millions of pellets a week, is carried out according to statistical methods that are worked out at division h.q.

Chemical and physical final acceptance tests are duplicated at Billingham to ensure that products consistently meet the rigorous specifications.

Billingham Research

Research on more efficient methods of production and on preparation of new catalysts is the responsibility of the Billingham research department, where fundamental problems of catalysis are also being studied. There are facilities at Billingham for both laboratory and pilot scale work and by the end of this year a pilot plant will be established at Clitheroe which will be particularly useful in the scaling up of catalyst preparations from a bench scale to full commercial production. The Clitheroe unit will also be available for the production of customers' special requirements involving small quantities of catalyst or for the production of small tonnages of any particular catalyst.

Among standard catalysts available from the division are the following: 22–1, nickel oxide, for methane-steam reaction; 32–2, zinc oxide, for desulphurisation of gases; 15–2, chromia-promoted iron oxide, for carbon monoxide conversion; 34–4, promoted iron oxide, for ammonia synthesis; 29–1, copper oxide/zinc oxide, for dehydrogenation and mild hydrogenation reactions; 26–1, copper oxide/chromia, for hydrogenation reactions; 11–1, nickel-oxide/chromia, for carbon monoxide trace removal; 17–1, nickel on selected kieselguhr, for olefine hydrogenation and saturation of aromatic nuclei.

While at Clitheroe, the CHEMICAL AGE learned that developments in the near future will hinge more on the opening up of new uses and new markets for catalysts rather than on an extension of the range of catalyst materials. New overseas markets are constantly being opened up and at present a sales team is investigating the market potential of iron-curtain countries. This visit follows enquiries received on the ICI stand at the recent Zagreb international fair. A large trade is expected to build up with Soviet-satellite countries.

Scientific Instrument Convention

The Scientific Instrument Manufacturers' Convention, to be held at Eastbourne from 24–27 October, is to include a panel of speakers on 'European free trade, a challenge', 'Presentation and publicity', 'Methods and materials for tomorrow', and 'Instruments for reactors and safety'.

New Postal Rates

The higher postal charges, effective from 1 October, will entail higher distribution costs for 'Chemical Age'. We are, however, endeavouring to absorb as much of these increased costs as possible. The present home annual subscription rate is to be maintained at 52s 6d; there is a slight increase in the overseas rate from 52s 6d to 60s. The charge for single copies has been raised from 1s 3d to 1s 6d (by post from 1s 6d to 1s 9d).

First UK Methane Shipments Will be Made in Converted Insulated Tankers

THE liquid methane which the Gas Council propose to ship from South America to the Thames in about 18 months' time will be transported in an insulated tanker converted for the work. CHEMICAL AGE learned this from a Gas Council spokesman on Wednesday after Sir Harold Smith, chairman of the Council, had referred to the subject on Tuesday at the annual gas sales and service conference in Harrogate.

Sir Harold said: 'Within the next 18 months an experimental ship will sail up the Thames containing a cargo of liquid natural gas, possibly from South America, to augment Britain's gas supplies.' The council had just received consent from the Minister of Power to import liquid methane gas. Shipment of natural gas would start as soon as possible to storage tanks being built by the North Thames Gas Board.

The ship will not be refrigerated. The gas will be refrigerated before shipment in South America, possibly in Venezuela, and the ship will contain insulated tanks. The 3,500 liquid ton ship will be a reconstructed tanker which will carry 2,000 tons of light methane. This will be stored in two 1,000 ton tanks that are being built on Canvey Island, Essex, by the North Thames Gas Board. There the gas will be vapourised and then piped to Romford Gas Works for reforming and piping into the board's grid.

The vessel will be powered by its own cargo of natural gas. It was stated that the cargo would be held at a temperature of -250°F. Tanks will be of an aluminium alloy inside steel with an insulation of 'volcanic dust' between. An interesting point that arises here is that without refrigeration of the tanks, there should be some 'bleed-off'.

For the chemical industry, a point of great interest is whether methane will be available on a substantial scale, and at what price, as a raw material for chemical synthesis. At present not much is known of the chemistry (general and processing) of methane in this country, apart from work by the gas industry.

The Gas Council stressed that this project is still only experimental and it will have to be seen how the experiment works before a decision can be taken to continue the idea. It is estimated that to provide all the country's gas requirements in this way would call for six tankers each of 30,000 tons gross. Such a policy is not envisaged at this stage and it was stressed that the Government of the day would have to make the decision as to how much methane is brought in to augment what is made here.

If the experiment proves successful the Gas Council could import liquid methane and produce gas at a lower price than it is now produced from native materials. At present, no information is being disclosed about the economics of the experiment.

The significant feature of Sir Harold Smith's brief statement is the fact that Lord Mills as Minister of Power has given his consent to the project. After Sir Harold's speech, Dr. J. Burns, who has been associated with the development work, gave a brief interview on BBC Radio Newsreel.

Fuel Research Station's Work on Coal Gasification

Recovery of Germanium Uneconomic

INCREASING dependence of the country on imported fuel, mainly oil, during recent years in meeting industrial and domestic needs, is emphasised in the report of the Fuel Research Board for 1956, which with the Report of the Director of Fuel Research for the year 1956 is now available [obtainable from HM Stationery Office, price 4s 6d (81 cents in US), by post 4s 9d].

In 1956 coal production including 12 million tons of opencast coal was only 222 million tons. Coal equivalent of inland fuel consumption was 254 million tons including the equivalent of 1.2 million tons as hydro-electricity and 38 million tons as imported petroleum oils. In fact, the value of fuel imports at £414 million exceeded that of exports by £247 million. By greater efficiency in the use of fuels, based on better training of management and operatives and on improved equipment, the present industrial productivity could be achieved, it is stated, with a reduction in fuel consumption equivalent to about 10 million tons of coal a year.

The most important researches in progress at the Fuel Research Station have been, therefore, from the point of view of fuel economy, those concerned with improving the efficiency with which coal is used both in boiler plant and for domestic heating. Some 1,700 industrial boilers, or rather more than 15 per cent of the total number of types for which the Fuel Research Station smoke eliminators were designed, have been equipped with these eliminators. These not only greatly reduce the amount of smoke emitted but decrease the amount of coal required for the same amount of steam by 5 or 6 per cent on average. Saving of coal on the 1,700 boilers should therefore be in the region of 100,000 tons a year, a saving of £400,000 a year.

Fate of Germanium

Reference is made in the report to investigations on the fate of germanium in coal during combustion, carbonisation and gasification and in the possibility of recovering a larger proportion of the element.

It has been observed that germanium will normally be volatilised from a coal or coke only if combustion of the carbonaceous material also occurs. Germanium (some 8 per cent) volatilised during the carbonisation of coal may thus be restricted to the fraction associated with that part of the coal evolved as volatile products.

Almost all the germanium volatilised has been found in the tar and the ammoniacal liquor. The element is stated not to be appreciably volatile under the conditions of distillation of crude ammoniacal liquor and the greater part of the germanium in this liquor is retained in the effluent from the still. The report therefore suggests that it is unlikely that the carbonisation process will provide a waste product suitable for the economic recovery of germanium. Even though up to about 5 per cent of the germanium in the coal carbonised may find its way into the effluent from the ammonia still, its concentration in this liquid is only of the order of a few parts per million. Its recovery even in those cases where lime is not added during distillation is considered to be difficult and costly.

Work at the Station is being directed to the generation of producer gas from non-caking coal fires and coke breezes. Besides providing cheaper gas for heating gaswork retorts and coke ovens and for use in the steel industry, the gas can, of course, be used as a raw material for the synthesis of oil by the Fischer-Tropsch process.

In addition to the development of small pilot-scale plant for gasification, a laboratory-scale investigation is in progress on the distribution of sulphur compounds in the gases produced by the interaction of coke with air and mixtures of air and steam. This is directed to the possibility of making gas of low sulphur content by addition of materials such as lime or slag to the coke.

Retained to Late Stage

Results with coke alone show that in gasification with dry air the sulphur is almost completely retained by the coke up to a late stage and is then liberated at an increasing rate as hydrogen sulphide and organic sulphur compounds, mainly carbon oxysulphide. Gasification with steam, however, liberates most of the sulphur at an early stage, mainly as hydrogen sulphide. Mixtures of air and steam give intermediate results, it is reported. The gas obtained did not contain more than 5 grains/100 cu. ft. of sulphur as organic sulphur compounds.

In the presence of lime, the rate of liberation of sulphur appears to be stabilised with the amounts of hydrogen sulphide and organic sulphur compounds in the gas remaining nearly constant throughout the gasification. Gasification with dry air yields a gas containing little sulphur either as hydrogen sulphide or organic compounds. Total sulphur was about 5 grains/100 cu. ft. Addition of steam greatly increases the concentration of hydrogen sulphide.

Gasification of coal and conversion of the carbon monoxide and hydrogen so produced to a mixture of hydrocarbons and other organic compounds by the Fischer-Tropsch synthesis is suggested as the most promising method of producing liquid fuels and aliphatic chemical products from coal. Investigation by the Fuel Research Station has indicated that a liquid-phase, or slurry technique, in which the finely powdered catalyst is suspended in molten wax through which the synthesis gas passes, promises to have lower capital and operating costs than other methods.

Effects of process variables have been investigated therefore in small-scale reactors and in pilot plant, designed to produce 50 gallons of products a day. Construction and assembly of the control components for a fully automatic fixed bed unit are proceeding and a prototype reactor together with condensing system and product receivers has been erected for preliminary trials under semi-automatic conditions.

Suitable catalysts for the synthesis are stated to be those based on iron. The Station has been studying the factors affecting the reproducibility and performance of mill-scale catalysts and the conditions necessary for the large-scale manufacture of precipitated iron catalysts. Studies of poisoning of catalysts by sulphur compounds have also continued.

Exact mechanism of the synthesis reaction and knowledge of factors controlling the activity and other properties of catalysts are not well understood, the report states. Catalysts are being studied by gas absorption and X-ray diffraction methods; and measurement of changes in the photo-electric work function of catalyst surfaces accompanying absorption of reactants and reaction mechanism using radioactive tracer techniques are being studied as well. The possibility of modifying the behaviour of catalysts by exposure to ionising radiation is also being explored and increasing use is being made of chromatographic methods in examining reaction products.

Research has been undertaken by the Station into the flow properties of residual fuel oils. The situation which developed during the Suez crisis has emphasised the need for keeping adequate stocks. However, many fuel oils thicken on standing and become difficult to handle. Considerable progress has been made in understanding the changes that occur in oils with age and new viscometers have enabled measurements to be made in oils *in situ* in storage tanks. Moreover, from laboratory measurements, the rate at which oil can be pumped after long storage can now be predicted.

New Orders for Amber Chemical

TRIALS of the Amber combustion additives and fuel improvers by the Central Electricity Authority have been completed with highly successful results, declared Mr. D. G. N. Lloyd-Lowles, chairman of Amber Chemical Industries Ltd. at the annual meeting in London last week (see also p. 568).

The company has received orders for supplying the Marchwood Power Station and those at Poole, Bromborough, Ches. and Kingston, Surrey. It has also been instructed to install its process at Ince, Ches. and Tilbury, and at other stations as and when they are converted to oil burning. A similar process for use with solid fuel is being installed in Liverpool.

Uranium Hexafluoride Hydrolysis

A preliminary investigation of the hydrolysis of uranium hexafluoride by concentrated sulphuric acid has been carried out at the Chemistry Division, Atomic Energy Research Establishment, Harwell, by D. Davis. The work is reported in a paper AEREC/M 300. It is stated that the reaction proceeds smoothly to give a precipitate of $U^{(VI)}$ sulphate with only slight reduction to $U^{(IV)}$.

★ In its short life, the 15-year-old catalyst factory at Clitheroe, Lancs, has had a chequered career. For one thing not many factories have been completely rebuilt during that time (see page 551 for report of opening and description of plant).

Built during the war by ICI Billingham division at Government request, it was purchased by the company in 1950. One of its more glamorous jobs was the production during the latter part of the war of Victane, an aviation spirit additive made from Victor oxide. This was produced to boost the speed of the Spitfire to enable it to catch flying bombs.

Successors of this catalyst are vanadium pentoxide for phthalic acid, and a range of some 20 other 'standard' catalysts for a wide variety of industries and uses. After meeting all the needs of ICI plants, the factory is still able to supply other markets, mainly export. The largest single market is in the US, although high hopes are held of trade with iron curtain countries.

Alembic learns that West Germany is one of the main competitors to British catalysts. Although German catalysts are generally cheaper, they are of relatively low quality and there is increasing realisation that it is better economy to pay more initially for a product with a longer life as a catalyst.

★ Alembic was amused to receive one of the menu cards for the recent annual dinner of the First Aiders of the United Sulphuric Acid Corporation Ltd., which was held at the Central Hotel, Widnes. Appropriately it had a distinctly medical flavour.

To begin with there was floating rib soup. This was followed by creme de capillaries a la femur; grille pancreas and white corpuscle sauce. For sweet there was iced spleen and as an aperitif members were offered 'blood'.

★ At a more conventional dinner last week, Alembic listened attentively to speeches that were not presented! Because Sir Kenneth Hague, deputy chairman and joint managing director of Babcock and Wilcox, had gone down with 'flu (suspected Asian) the Council of British Manufacturers of Petroleum Equipment were deprived of the presence of their chief guest at the annual dinner held at the Dorchester.

Chairman, Mr. G. H. Thorne (Dawnays Ltd.), amid sustained applause, said there would be no speeches. He then proceeded to tell the 900 members and guests present what he would have said if he had made a speech! After resuming his chair he rose again to tell members what Sir Kenneth might have said if he had made use of the notes provided by the Council.

★ Powerful reasons (from the political point of view) why the Labour Party should review its nationalisation policy in regard to the chemical industry were put in *Forward* last week. Mr. Roy Jenkins writing on 'State Industry' reminded readers that there were today no obvious candidates for nationalisation.

Looking at what remained of the party's nationalisation list in 1955, Mr. Jenkins said 'A trace of a list remained then in so far as there was a rather indefinite proposal relating to the chemical industry. It did not help, particularly in the chemical constituencies'.

Coal nationalisation was a vote-winner in the mining constituencies before 1945, but chemical nationalisation proved to be a vote loser in Cleveland and several other places in 1955. Mr. Jenkins added 'It would be foolish not to recognise this fact.' He commends the present policy of 'back-door nationalisation' through the acquisition of shares; a policy that Alembic feels to be more pernicious than direct expropriation.

★ A less controversial political question is due to come before the Conservative Party's annual conference at Brighton next week. A resolution from the Newcastle West association urges the Government to take active steps to prevent the pollution caused by chemical deposits emanating from CEA power stations.

Coming from Tees-side, it is surprising that the resolution includes no mention of the highly polluted waters of the Tees. A solution of that problem would give the chemical and other industries in the north-east a vastly increased water supply, as well as appeasing the anglers of that area.

★ In touring the new pharmaceutical research laboratories of ICI, Alembic was particularly struck by the considerable use of wood in the building. Most corridors are composed on one side of continuous two-door mahogany cupboards which house cylinders, apparatus and in most cases allow access to the water, steam, air and heating systems servicing the laboratories. Laboratory benches are built of teak, the surface of which has been treated with plastics.

Also notable are the precautions taken for safety of personnel in the chemical laboratories, such as wired glass for fume cupboards, used for carrying out dangerous reactions, sheets of protective glass in front of bench vacuum distillation apparatus and special remote controlled cubicles for autoclaves. Gas cylinders are stored in corridor cupboards and are connected, as required in the biological laboratories, through special fitments. The special sterile cubicles of the infectious diseases laboratories, are elaborately equipped with bacteriologically filtered air, ultraviolet light and sometimes filtered exit air.

For eye protection in the cubicles equipped with ultraviolet light, the movable window is electrically controlled, so that the window shuts immediately the light is on and cannot be opened while it remains on.

★ After many months of appetites whetted by occasional references to the proposal to ship liquid methane from Venezuela to this country, the Gas Council has at last released some information (see page 552). Apart from Sir Harold Smith's initial contribution, a number of spokesmen from the Gas Council and the North Thames Gas Board have made statements, some conflicting.

The information that we publish is based on statements from the Council and from Dr. J. Burns. We were told, for instance, that no information on costing or future plans can yet be released. But the *Daily Telegraph* on Wednesday, quoting an official of the North Thames Gas Board, said that the initial project (including cost of tanker conversion and storage tanks?) would cost about £300,000. It was added that if the present experiment was successful, then a total of 24 storage tanks would be built.

It is obvious, therefore, that the situation should be clarified as soon as possible with an authoritative statement giving more details of the project.

★ One of the most significant features of the International Geophysical Year will be the launching of the much-discussed earth satellites. These unmanned spheres are intended to gather scientific data while speeding at 1,800 m.p.h. round the earth's orbit at a height of between 200 and 1,400 miles.

One of a series of satellites now being developed has just been 'cocooned' by operatives of R. A. Brand and Co. Ltd. to ensure complete protection for the gold-plated satellite while it is shipped back to the US plant of Brooks and Perkins, Detroit, where it was made.

The sphere was sent to this country because it is made basically of magnesium, the most suitable metal for the extreme demands which will be made on the satellite. The work was carried out at the factory of Magnesium Elektron Ltd., Clifton Junction, Manchester.

Alembic

Carbon And Graphite Conference

SCI's Three-day London Meeting Attracts Nearly 400 Delegates

NEARLY 400 delegates attended the three-day conference arranged by the Society of Chemical Industry, on Industrial Carbon and Graphite, and held at the William Beveridge Hall of London University from 24 to 26 September. Seventy papers were accepted by the organising committee set up under the chairmanship of Dr. H. K. Cameron. These papers were grouped as follows: Introduction and physical properties (Session I), manufacture (Session IIA), crystal structure (Session IIB), surface chemical properties and reactivity (Session III), electrical behaviour and applications (Session IV), graphite in the nuclear power industry (Session V), and mechanical, chemical and metallurgical applications (Session VI).

Many of the papers were contributed from abroad from such countries as the US, USSR, France, Poland, Holland, Germany and Norway. Short notes on those papers of particular interest to the chemical and chemical engineering industry are given below.

Micro-Structure of Carbons

AFTER an introductory discussion of the complexities of the micro-structure of carbon (intercrystalline bonding, microporosity and frozen-in stresses) the type of information obtained from a study of carbon powders under pressure was reviewed by S. Mrozowski (University of Buffalo, Buffalo, US) in his paper on the 'Nature of artificial carbons.'

To estimate the macro-stresses created in an artificial carbon during baking as a result of shrinkage of the binder coke, the picture of a compressed powder was applied. This same picture was used to develop a model of a bonded carbon material. The two-component model has to be refined, according to Mrozowski, to include the different types of interaction between the binder and the particle cokes. Changes in the order of processing operations alter not only the geometrical relations but also lead to changes in microstructure and micro- and macro-stress distribution and consequently affect all the physical properties of the filler and binder cokes.

Attention was drawn to the finding that when carbon is impregnated and rebaked (and regraphitised) the co-efficient of expansion of the carbon piece is found to be higher as a result of impregnation. To clarify this effect Mrozowski has examined the behaviour of single pieces of coke with and without impregnation (soaking with binder and rebaking).

It is stated that coke pieces show a considerably higher expansion after impregnation, the relative increase being greater if the coke was impregnated before calcination than if the coke was impregnated after calcination and then rebaked (about 10 to 25 per cent increase for soft coke). No difference in the X-ray diffraction pattern for graphitised (2,400°C) soft cokes which were soaked with binder, raw and after calcination, was found but a 'quite remarkable difference' was found for a phenol-benzaldehyde resin coke heat-treated to 2.400°C after impregnation with the same resin. A sample soaked with binder in the raw state (about 500°C heat treatment) showed a considerably higher resistivity and more diffuse X-ray diffraction times than the one impregnated after calcination (1,200°C).

Recently, Mrozowski stated, his laboratory had tested a batch of laboratory-made calcined coke rods baked in addition to temperatures in the range 500° to 1,000°C. In this range the elastic modulus increased first with heat-treatment, reached a maximum at about 900°C (total increase about 25 per cent) and subsequently decreased. The maximum is stated to occur for a heat-treatment when all foreign gases are expelled, the strong shrinkage process is finished and the hydrocarbon binder-coke material changes into a pure carbon.

Pitch as a Binder

AN ACCOUNT of work done in the late 1920's was given by R. Lessing in 'Precipitated pitch as binder' in connection with a new method for preparing carbonaceous artifacts. Although applied originally to the production of high-quality smokeless briquettes from anthracite duff, the author stated it was equally suitable for bonding pure carbon into electrodes or blocks for other purposes, ores prior to sintering or for compacting other materials.

The process consists of the treatment of coal tar with non-aromatic hydrocarbons of suitable boiling range which extract the tar oils and precipitate pitch. 'Cracking' of pitch is stated to be avoided and the amount of non-binding 'free' carbon is considerably reduced. The pitch is mixed with debenzolised coal tar and when the sticky paste so formed is mixed with solvent, the pitch is precipitated and coats the surface of each particle with a continuous thin film. The oil solution is removed and stripped of solvent. Residual solvent adhering to the pitch-coated particles is removed by superheated steam and recovered.

Blocks formed in conventional presses from the coated particles are stated to be extremely strong and can withstand a high crushing load even in the 'green' state. Heating has been carried out in two stages. Primary treatment was carried out at approximately 250°C when rapid decomposition of the pitch occurred in the outer layer and a sufficiently hard crush formed to preserve the shape under the crushing load of the superimposed charge. The subsequent heating takes place at about 400°C when baking occurs.

The work was carried out during a period of depression in the coal industry and Lessing suggests that with the aid of the improved knowledge and accumulated experience of chemical engineering practice, it could be resumed and developed to meet the need not only for smokeless fuels but for the ever-expanding carbon industry.

Crystallographic Orientation of Graphite

A METHOD for the rapid determination of the 'Preferential crystallographic orientation in products of technical graphite' was described by D. Ali, E. Fitzer and A. Ragoss (Siemens-Planawerke AG.). It is based upon a self-recording focusing procedure with a counter. Although a separate sample is needed for each exposure the authors of this paper stated that they believed it to be a time-saving and simpler method because of the reduced exposure time and the easier evaluation due to the application of the counter-goniometer. Two exposures, parallel and perpendicular to the pressing or extrustion direction, are necessary only, because of the elliptical relation governing the angular positions.

From the results obtained Ali *et al.* had reported that the degree of orientation in graphite could be given as the distribution of 002-plane in the various angular positions. This was achieved by measuring the intensity of 002-line by an X-ray, back-reflection method. The 002-intensity was shown to be in an elliptical relation to the angular position to the pressing direction.

This elliptical relation was found and confirmed for samples of both natural and artificial graphite, irrespective of whether pressing or extruding had been used. It had been possible, therefore, for these investigators to estimate the distribution of the layer-planes within a graphite sample by the 002-intensity in two preferential angular positions. They stated also that they were now able to formulate for the 002-intensity as a function of the angular position exactly as a result of the elliptical relation of the 022-intensity with the inclination to the pressing and extruding direction.

The values of preferential orientation in fine-grained bodies made of natural or artificial graphite (by X-ray methods) were shown to correspond surprisingly well with those of the anisotropy co-efficient of the electrical resistance of polycrystalline bodies. The deviation which these workers observed with the pressed body of synthetic graphite was considered to be due in all probability to the high percentage of the carbon-black constituent which diffracts X-rays diffusely. Anistropy value evaluated from the co-efficients of thermal expansion was stated to be greater than

that calculated from X-ray diffraction data. Coarse-grained bodies were found to show marked deviations from the above, and it is suggested that the 'macroscopic structure' had at least a predominant influence on the anisotropy of the electrical resistance. The co-efficient of thermal expansion deviated less from the anisotropy quotient derived from the X-ray diffraction as this is less affected by the 'macroscopic structure.'

Porosity and Absorption Properties

ABSORPTION on sorbents with an energetically non-uniform surface for which a typical manifestation is a sharp decrease in differential heat of absorption depending in magnitude on the degree of filling of the pores, was the subject of the paper by M. M. Dubinin (Institute of Physical Chemistry, USSR Academy of Sciences, Moscow) which was entitled 'The porous structure and absorption properties of active carbons.'

On the basis of extensive experimental material, Dubinin reported that he had succeeded in establishing the characteristic features of the distribution of the absorption-space volume according to absorption potentials for the extreme structural types of active carbons.

Active carbon of different structural types may be produced by progressive activation of carbonised organic materials with gaseous compounds (H_2O, CO_2) at temperatures of 850-950°C. Moderate activation, with charring approximately 50 per cent, yields specimens of active carbons of the first structural type. At this stage of activation, stated Dubinin, there is a gradual increase in the dimensions of pores. When charring exceeds 75 per cent, active carbons of a second structural type are formed. The regions of intermediate charring, approximately from 50 to 75 per cent, correspond to active carbons of mixed structural type.

Dubinin discussed in detail the porous structure of active carbons. From his detailed examination of many specimens of active carbons of the first structural type he has established that the micropore volumes of the carbons lie within the limits of 0.15 to 0.05 cm ^{3} g. $^{-1}$. Their effective radii, he suggested, probably do not exceed 10Å while the specific surface area values according to an approximate assessment, lie in the interval between 400 and 900m. ^{2}g $^{-1}$.

Generally active carbons possessed a tridisperse porous structure, Dubinin stated. He reported that for many carbon specimens, the volume of transitional pores was extremely small (L/O 0.05cm.^{3}g^{-1} and the specimens were practically bidisperse systems containing two-pore varieties—micro- and macropores. As activation approached its limit, however, the carbon micropores developed to the dimensions of transitional pores with a simultaneous increase in the size and volume of the macropores.

From analysis of absorption isotherm equations, Dubinin concluded that absorption of gases and vapours by active carbons took place in the micropores of the carbon. The larger-pore varieties had, he stated, practically no significance for equilibrium absorption. The micropores might therefore be called the absorbing pores, their volume being filled with condensed vapour in the primary absorption process. The macropores played the rôle of large transportation arteries making the internal parts of the carbon grains easily accessible for the molecules absorbed. A similar rôle, but as smaller transportation arteries, was also played by the transitional pores of the carbon in cases of absorption of gases or vapours.

Capillary Structure of Coal

RESULTS of investigations carried out by R. L. Bond and D. H. T. Spencer, (British Coal Utilisation Research Association, Surrey) into the 'Ultra-fine capillary structure of coals and carbonised coals' are stated to have led to a better understanding of the changes that occur in physical structure of coals on carbonisation.

Both the low and high-rank coal studied exhibited molecular sieve properties. The widths of the constructions in the ultra-fine capillaries in the coals and their 400° and 600°-chars are stated to be bimodally distributed about the values of 5Å and 8Å On carbonisation to 600°C no great change in the essential capillary structure of either coal occurred, although the molecular sieve properties of these materials were enhanced and an increase took place in the internal free volume above 400°C. As carbonisation temperature rose above 600°C, internal free volume still increased but accessibility of space decreased markedly.

In chars prepares by carbonisation to 900°C, neon, krypton and methyl alcohol showed differential penetrations, carbonisation to 1,100°C reduced the widths of the capillary constructions to such an extent that only helium, neon or hydrogen were able to reach the extensive internal surface still present.

Measurement of the surface areas of a number of coals representing a wide range of ranks and of 600°-chars indicated that the methyl alcohol heat of melting areas even for low-rank bituminous coals are not in error by more than a factor of four and that for high-rank coal, including anthracites, the error is negligible.

Gas Flow Through Graphite

A STUDY of 'The flow of gases through a fine-pore graphite' over a range of conditions of mean pressure, pressure drop and temperature and gas molecular weight, was undertaken by J. M. Hutcheon and B. Longstaff (Chemical Engineering Div. AERE Harwell) and R. K. Warner (Australian Atomic Energy Commission attached to AERE Harwell). A fine-pore commercial graphite was used. The results obtained have been correlated by an equation for simultaneous viscous and slip flow of a gas in a porous medium.

Average values of the viscous and slip permeability co-efficients of the graphite were 1.63 x 10 $^{-12}$ cm. and 1.12 x 10 $^{-7}$ cm. respectively; the co-efficients were independent of temperature.

Investigation of Heterocarbons

HETEROCARBONS containing (a) oxygen (b) sulphur and (c) nitrogen have recently been investigated by C. Baraniecki, H. L. Riley and E. Streeter (Rotherwood Laboratories, United Coke and Chemicals Co. Ltd., Sheffield.) Their results are reported in their paper 'The solid complexes of carbon with oxygen, nitrogen and sulphur.'

Experiments with carbon-sulphur complexes showed that these did not interact with finely dispersed silica at the lower temperatures. In the range 1,200° to 1,400°C, there were definite indications of the formation of silicon disulphide. Interaction between ferrous sulphide and the carbon-sulphur occurred above 1,200°C. These results, stated Baraniecki *et al.*, suggested that an acidic coal ash would have little effect on the high temperature elimination of sulphur from a sulphur-carbon complex. In the presence of excess iron oxide, excess sulphur would be retained in the coke as ferrous sulphide to high temperatures (1,300° to 1,400°C.)

Interest in carbon-nitrogen complexes was revived by some results obtained in a study of the carbonisation of hexamethylenetetramine. The results obtained indicate that a 400°C hexamine char, on being heated to temperatures about 400°C shows a crystallographic behaviour similar to that of coking coals, etc. Support for the view that some kind of crystallisation phenomenon occurred in the early stages of pyrolysis was provided by high-pressure carbonisations. The high nitrogen contents of the chars made from hexamine provided further evidence that the nitrogen atoms were intimately associated with the carbon in the crystal structure of the char. (Further details on experiments with carbon-nitrogen complexes are to be published later.)

These investigators stated that there was little doubt that heterocarbons made up a very large group of substances. The chemical and crystallographic behaviour of the carbon-nitrogen complexes was the most convincing evidence on this. The properties of the carbon-sulphur complexes suggested that they were similar substances and from analogy and their pyrolytic behaviour. Baraniecki *et al.* had little doubt that the carbon-oxygen complexes fell into the same class. The suggestion was made that evolution of the hetero-atoms as temperature was increased required further detailed study, for the authors of this paper considered that it was likely to throw light on the nature of amorphous carbons, and that it was likely to influence the character of the carbon remaining after the foreign atoms were expelled.

Also of interest, suggested these investigators was the rapid and complete interaction of the nitrogenous char with ammonia for it was considered that the experiments might be of assistance in the problems of carbon reactivity. The effect of passing ammonia over carbon at red heat was to produce ammonium cyanide and this reaction is suggested as a source of amonium cyanide.

REACTIVITY OF CARBONS

WORK described by H. Harker, H. Marsh and W. F. K. Wynné-Jones in their paper 'Surface oxides of carbon and graphite' was a continuation of previously reported studies by two of the authors (Wynne-Jones and Marsh) and Blayden of the reactivity of carbons to oxidising gases, together with associated properties of the carbons. Many chars, including those from cellulose, have been prepared. Surface areas of these have been found to remain constant to a carbonisation temperature of 1,000°C., but above this temperature they dropped rapidly.

Their investigations, the authors report, have made them realise that for too long carbon has been considered an element, for analyses of carbon normally show the presence of hydrogen and oxygen together with other elements, which affect the properties of the carbons.

They have established that when CO_2 reacts with carbon a shale surface-oxide is formed simultaneously with CO. No conclusive evidence was obtained for the decomposition of surface-oxide according to the reaction $C(O) \rightarrow CO$ (Stage II), or that retardation can occur by absorption of CO (Stage III). In general, two simultaneous equilibria were concerned in the reaction between CO_2, CO and mixtures of these gases with carbon, thus:

$$CO_2 + C \rightleftarrows C(O) + CO$$
$$CO_2 + C \rightleftarrows 2\,CO$$

During the reaction of CO_2, in the temperature range 650° to 900°C, with outgassed carbons of widely different reactivity, surface-oxide was formed in amounts which progressively approached a maximum. It was not possible to demonstrate the immediate desorption of surface-oxide (Stage II) under the experimental conditions used. The rate of surface-oxide formation from pure CO was found to be much lower than that from CO_2.

Harker *et al.* were unable to confirm that absorption of CO plays a significant part in retarding the reaction, $CO_2 + C \rightarrow 2CO$. Their experiments support the view, however, that formation of CO_2 in the reaction $C(O) + CO \rightarrow CO_2 + C$, leads to an apparent retardation of the reaction.

It is concluded that the rates of the above reactions govern the experimentally determined relative reactivities of carbons, and they are themselves a function of the nature and availability of the carbon surface and the amounts of mineral impurities. The relative importance of these factors is to be examined.

Graphitic Oxide

A SURVEY of the methods used in studying graphitic oxide and of the main results obtained were given in the paper 'Graphitic oxide' by J. H. de Boer and A. B. C. van Doorn (Rijksverdedigingsorganisatie, T.N.O., Netherlands).

All graphites used by the authors were purified by treatment with cold concentrated hydrochloric acid, hydrofluoric acid and again with concentrated hydrochloric acid, containing less than 0.1 per cent ash after treatment.

It was found that one gram of graphitic oxide oxidised 32.7 ± 0.2 mequiv. of $TiCl_3$ and 28.0 mequiv. of HI (using potassium iodide in 2N-H_2SO_4). Low values of HI reduction were caused by an occlusion of the iodine. Even after vigorous treatment, dried reduced samples of graphitic oxide contained two to three per cent of iodine. In this way it was observed that one gram of graphitic oxide formed 32.6 ± 0.3 mequiv. of iodine, i.e. 4.9 mequiv. per unit $C_7H_2O_4$.

In reducing graphitic oxide with NaI in acetic anhydride, only 29.4 mequiv. of iodine per gram of graphitic oxide were obtained. Composition of these reduced samples appeared to be $C_7H_{1\cdot0}O_{1\cdot3}$. Acetylation of graphitic oxide was investigated and it was found that all samples of the oxide, prepared from four different graphites and acetylated, contained 5.2 ± 0.1 mequiv. of acetyl per gram of acetylated graphitic oxide.

From tests on the reduction of graphitic oxide and analysis of these, the empirical formula $C_{5\cdot6}H_{0\cdot6}O_{0\cdot8}(O.COCA_3)_{0\cdot26}$ or $C_7H_{0\cdot7}O_{1\cdot0}(O.COCH_3)_{0\cdot3}$ were found, and it is stated that it is apparent from the empirical formula $C_7H_{0\cdot7}O_{1\cdot0}(O.COCH_3)_{0\cdot3}$ that there is no OH group present in the reduced graphitic oxide having a composition C_7HO. The hydrogen atom is the 'aromatic' hydrogen from the keto-enol equilibrium. The formula specified by de Boer and van Doorn is $C_7(O_3H)(:O)H \rightleftarrows C_7(O_3H)OH$.

From infra-red spectroscopical investigation it is concluded that besides the keto-enol equilibrium there are present the following groups: OH and C—O. No C=O groups other than the keto-groups are present. It is suggested therefore that at the moment the structure of graphitic oxide can best be described as $(C_7O)(OOH)(=O) \rightleftarrows (C_7O)(OOH)(OH)$.

High Temperature Pyrolytic Carbon

MASSIVE specimens of pyrolytic carbon have been prepared by the breakdown of hydrocarbon gases at various temperatures and sub-atmospheric pressures. The method used to produce these was described by A. R. G. Brown and W. Watt (Royal Aircraft Establishment, Farnborough) in a paper on the 'Preparation and properties of high-temperature pyrolytic carbon'.

Analysis of the deposited material showed that it consisted essentially of carbon with very small amounts of hydrogen (carbon 99.75 ± 0.25 per cent; hydrogen trace). At lower temperatures the deposit was composed of 98.9 per cent carbon and 1 per cent hydrogen by weight. Density of the deposited carbon was stated to be dependent only on the temperature of deposition. Minimum reported density was 1.14 g./cm.³ for deposition at 1,700°C and maximum 2.22g./cm.³ at 2,100°C. Brown and Watt also suggested that the density is dependent on the surface mobility of carbon atoms immediately after deposition.

In a consideration of the structure and properties of the deposited carbon these workers reported that the deposited carbons have a structure of hexagonal layer planes of carbon atoms as in graphite, these planes all lying parallel to each other and the surface of the substrate but otherwise randomly orientated.

The deposited carbons could be graphitised by heat treatment at temperatures of 2,500°C and over, the change being most marked in the deposits formed at 1,600°C. Graphitisation was accompanied by an increase in density in the deposits formed at 1,600°C.

Electrical resistivity and thermal conductivity of the deposits were also shown to be dependent on temperature of deposition. For material produced at 1800°C electrical resistivity is 2200 x 10^{-6} ohm-cm., thermal conductivity 0.06 g.-cal. cm/cm.² °C sec; for that deposited at 2100°C the corresponding values are 200 x 10^{-6} ohm-cm. and 13 g.-cal. cm./cm.² °C sec.

Carbon-Oxygen Reaction at High Temperature

INVESTIGATIONS were undertaken by R. J. Day, P. L. Walker, Jnr., and (the late) C. C. Wright (The Pennsylvania State University, US) in order to expand available information on the carbon-oxygen reaction to high temperature-high gas velocity conditions. Their work was reported in their paper, 'The Carbon-oxygen reaction at high temperatures and high gas flow rates.'

Day, *et al.* stated that the rate of petroleum coke carbon combustion was found to increase proportionally with the square root of the gas injection velocity at carbon surface temperatures of 1,500° to 2,000°K. The rate of petroleum coke carbon consumption was directly proportional to the oxygen concentration from 37 to 100 per cent at all temperatures studied. The apparent activation energy for the combustion of petroleum coke carbon decreased from 5.3 to 2.3 k cal. mole as the gas injection velocity increased from 5,000 to 60,000 feet per minute. Nitrogen, helium, carbon dioxide and carbon monoxide were found to act merely as diluents during combustion, water vapour decreased the product CO/CO_2 ratio, and chlorine was found strongly to retard the combustion reaction.

These results, the authors state, indicate in the main the importance of using a high gas-injection velocity if rapid combustion rates of carbon are desired.

Oxidation of Carbon and Graphite

WORK which has been carried out during the development of industrial carbon products with improved oxidation resistance was described by F K. Earp and M. W. Hill (Morgan Crucible Co. Ltd., Battersea, London) in 'Oxidation of carbon and graphite'.

A simple technique was used to study oxidation rates in air of a range of industrial carbon and graphite materials and the reaction was shown to be temperature-dependent, obeying the classical Arrhenius activation energy equation up to 700°C for conditions of low air-flow. It is stated that above this, temperature no longer was a controlling factor, and the reaction becomes so fast that it was probably diffusion-controlled.

Graphitic materials were found to have a much higher resistance to oxidation than amorphous carbon, but only significantly so at temperatures below 700°C.

It was reported that Earp and Hill's investigations have shown how wide was the range of reactivity obtained with different industrial carbon and graphite materials, and that materials could be produced which were usable for long periods in air at temperatures of about 550°C. It was also demonstrated that whereas most inorganic impurities would catalyse strongly the oxidation of carbon and graphite, a wide range of phosphates and some borates would inhibit the reaction. This inhibiting effect was not permanent, it is stated, but it was felt that a more detailed study of the mechanism of phosphates retardation was required.

Chemical Uses of Carbon and Graphite

Reference was made by K. F. Anderson (Morgan Crucible Co. Ltd., Battersea, London) in a consideration of 'Carbon and graphite in the chemical and allied industries' to the extensive use of carbon in its impervious form, to combat chemical corrosion in a variety of industrial applications. He reported that despite its lack of ductility it could be considered as a structural material for most items of chemical plant, and if incorporated with careful design, it could be very durable. The necessity of impregnating formed carbon shapes with resin to render them completely impervious under a wide range of chemical conditions was stressed. Maximum temperature which could be safely achieved with suitable available resins was approximately 250°C, although certain thick-walled carbon bodies could be used for handling gases and vapours above this temperature.

In its porous forms, stated this investigator, carbon had no temperature limitations, provided it could be protected from oxidation. In the presence of oxygen, carbon started to break down at temperatures of 350°C.

Against the above-mentioned limitations relevant in only a small percentage of chemical plant applications, there were the advantages such as the use of carbon in most corrosive fluids at normal temperatures without chemical deterioration. Main exceptions here were the highly oxidising acids such as nitric acid, sulphuric acid above 70 per cent concentration and chromic acid. Carbon also had good mechanical strength particularly in compression, even if it had to be handled carefully because of its brittle nature.

It was pointed out that although the new materials were relatively inexpensive, subsequent processing made carbon rather more costly than most common metals. However, under most chemical conditions, items of plant manufactured in carbon required far less maintenance than if made in other materials, provided they were protected from mechanical damage. This was a factor for careful consideration since maintenance costs in addition to loss of production could soon outweigh the difference in capital costs.

Typical uses of carbon outlined by Anderson were heat-exchangers, carbon chemical vessel linings, carbon pipe and fittings, carbon for filtration purposes, and carbon for electrolytic and cathodic protection applications.

Need for More Pollution Studies

'THOSE properties of coal and oil which inevitably affect the production of pollutants . . . have not in the past had that attention and study . . . which their importance deserves,' said Dr. R. Lessing in his presidential address at the Hastings Conference of the National Smoke Abatement Society (2 to 4 October).

Dr. Lessing discussed how specific properties or components of coal influenced the formation of smoke, grit and dust, and sulphur oxides.

The solution of the smoke problem was the replacement of open domestic grates by modern appliances or the use of smokeless fuel, together with the installation of mechanical stokers for the 40,000 handfired boilers in industry.

Grit and dust was a problem that was inherent in the coal supplied and mainly affected the industrial fuel user. In Dr. Lessing's opinion, if the National Coal Board could be persuaded to incorporate de-dusters in their coal preparation schemes, the problem of dust arresting on thousands of boiler plants would be eased and emission diminished.

Perhaps the most intractable difficulty was the avoidance of pollution from sulphur oxides. 'We must reluctantly admit that the sulphur inherent in the pure coal substance cannot be removed, except partially in the carbonising process.,' said Dr. Lessing. However, by appropriate preparation a substantial portion of high sulphur refuse could be washed out from the raw coal.

Of sulphur in fuel oils, Dr. Lessing said that recently desulphurisation of diesel and gas oils had progressed. 'One might expect that the oil refining industry . . . would contrive to find practical ways and means for the extraction—and recovery—of sulphur from their residual oils, which now contain up to 4 per cent and would tend to show higher sulphur percentages in the future'.

Other papers presented at the Conference included 'Meteorology and air pollution,' by Sir Graham Sutton; 'Air pollution by road vehicles,' part 1, by H. E. Styles and A. T. Wilford, and part 2 by James R. Archer-Burton; 'The administration of the Clean Air Act 1956,' part 1, by M. Lindsay Taylor, part 2, by G. Graham Don, and part 3, a report on the present problem; 'Industry and the Clean Air Act,' by Leslie A. W. Jenkins; and 'Fuel efficiency and clean air,' by Angus Macfarlane

First Commercial Silicon Transistors

A NEW PLANT for the production of semiconductors was formally opened in Bedford by the US company of Texas Instruments Ltd. on 1 October. Under the direction of Mr. Dudley Saward, the plant will produce silicon transistors for the British market. The company claims that this type of transistor is superior to the germanium type, because of its ability to operate at temperatures up to 150°C. Texas Instruments intended to market their semiconductors exclusively to industry at first but they consider that there is a great future for them in guided missiles, high speed aircraft and communications.

The plant was constructed by Lindum (Lincoln) Ltd. in six months from the drawing up of the first plans in January, and on 22 August the first silicon crystal to be 'grown' outside the US on production line equipment, was produced.

One of the greatest drawbacks to the large scale production of silicon transistors at the present time is their cost by comparison with conventional valves. Silicon transistors are five times more expensive than those of germanium. This is in part due to the high percentage of rejects on factory production, calculated to be as high as 50 to 80 per cent. However, the situation is considered to be a temporary one, owing to the comparatively early stage of development of the transistor at present. Texas Instruments are starting production with silicon rectifiers having current ratings of 400 milliamps and 750 milliamps with peak inverse voltages ranging from 200 to 600 volts, and in the near future rectifiers with current ratings up to 5 amps with similar peak inverse voltages will be introduced.

Courtaulds' to Close Rayon Plant

ABER WORKS, one of the four rayon plants of Courtaulds Ltd. in Flintshire, is to be closed at the end of the year. Production is to be reduced by 50 per cent next week and the remaining 50 per cent will be run down between now and Christmas.

The company's other three plants in Flintshire will continue and as many as possible of the 1,275 employees at Aber Works will be transferred to them.

New Automatic Plant for 'Purest Fluorides Yet Made in UK'

Installed by R. Cruickshank Ltd.

NEW AUTOMATIC plant claimed to make the purest fluorides ever produced in Great Britain has been installed by R. Cruickshank Ltd., Charles Street, West Bromwich (see CHEMICAL AGE, 28 September, p. 493).

The company, which manufactures hydrofluoric acid, fluorides, bifluorides and certain double fluorides, planned and developed a system of manufacture which besides being more completely automatic than anything known previously in medium-sized firms, would ensure that the products were without any trace of lead or other impurities.

Put into operation in July, the new system has already proved so successful, the company reports, that production has been increased with the same labour force and the purity of the products has attracted much interest particularly in export markets.

First stage of the system is the manufacture of hydrofluoric acid which is passed to carbon-lined autoclaves. The carbon lining replaces the lead lining used in autoclaves previously and ensures that there is no lead trace in the product. Solid raw materials are added to the acid in the autoclaves by conveyor. The mixture is then automatically agitated, the fluoride being prepared in the form of a slurry.

This slurry is conveyed by pipe to a rubber-lined rotary vacuum filter, working at an average of about 24 inches of vacuum, maximum being 30 inches. The filtrate drawn through the rotating drum is passed by pipe to a tank where it is collected for use in the manufacture of subsequent batches.

The fluoride, deposited on the outside of the drum in the form of a crust, is removed automatically by a knife as the drum revolves. It then drops into a short length of mixer-conveyor which takes it to the entrance of a pneumatic drying plant. From this plant the fluoride, now a moisture-laden powder, is fed by gravity into a disintegrator which forms part of the drying plant.

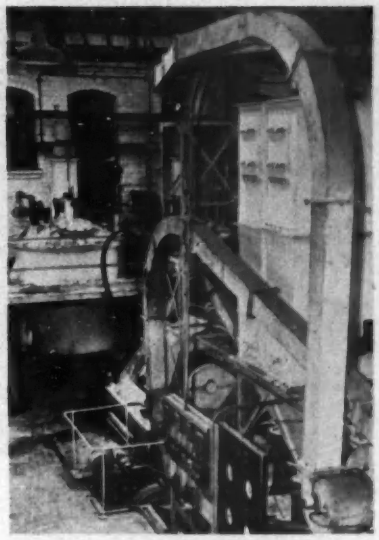
The whole of the tubular system of the drying plant is kept at slight vacuum by a fan. Air is drawn through an oil burner and passes, dried and heated, to the disintegrator. At this point it picks up the fluoride and conveys it at considerable speed back to the point where the heated air is entering the system.

Air and dried powder are then withdrawn into the second part of the system, incompletely dried powder re-circulating to the disintegrator and back to the withdrawal point any number of times until the powder is completely dry, when it is removed by the action of a vortex automatically created in the circulation of the air, at this point in the ring system.

Dried powder passes into the final part of the system with the air which is being withdrawn, moving along a further stretch of tubing to a cyclone. It is then drawn down by the centrifugal action of another vortex into a shute, where it is bagged off as required, samples for testing being taken from each bag. Air passes on through the fan which keeps the system at vacuum to the atmosphere via a vent on the factory roof. (The air picks up so much moisture from the powder that it appears to be steam as it issues from the vent on damp days.)

In the old system the product was handled three or four times. First the slurry was drawn off from the autoclaves and allowed to dry in deep vessels from which it was dug and loaded into trays. The trays were then taken by hand-pushed trolley to either steam or oil-heated ovens, which took several days to dry out the powder completely. The trays had then to be taken to a milling machine which produced the fine powder of the final product.

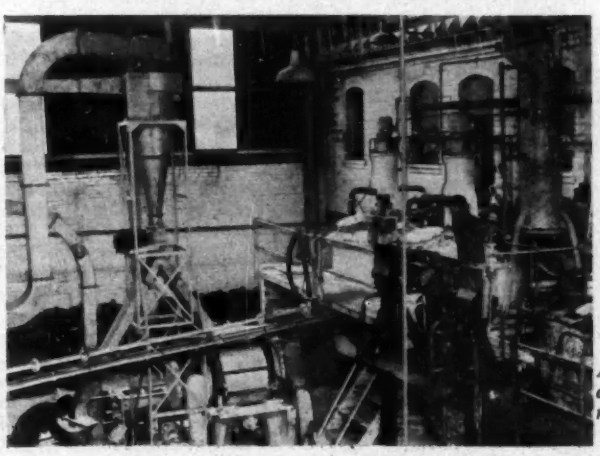
All this meant that a considerable amount of dust was created in the atmosphere of the factory, much labour was unproductively engaged in pushing trolleys about and much fuel used in heating large ovens, trays and trolleys.



Ring drying system of the new automatic plant for the production of fluorides at R. Cruickshank Ltd. An autoclave can be seen on the left

With the new system dust has now been eliminated, and men previously engaged in the fatiguing job of trolley-pushing have been found more productive work. The fuel used to heat the ring drying system is considerably less than that used to heat the ovens, and in addition one batch of powder goes through the system in a matter of hours instead of days.

R. Cruickshank Ltd., who have been making chemicals for more than 50 years, are one of only three or four manufacturers of fluorides in this country. They export a considerable part of their production to countries all over the world, and they expect that their new plant will help them to withstand German competition in overseas markets. The Charles Street, West Bromwich, factory, where fluorides have been manufactured since the first World War, is a branch of the well-known electro-plating engineering firm of R. Cruickshank Ltd., of Camden Street, Birmingham.



Autoclaves are shown on the right, with the rotary vacuum filter in the centre

SAC Midlands Paper on Inorganic Wastes

'THE determination of some inorganic substances in trade effluents' was the subject of discussion at a meeting in Birmingham of the Midlands section, Society of Analytical Chemistry, on 12 September. The discussion was opened by Mr. N. T. Wilkinson, of ICI alkali division, Northwich, who read a paper on methods for the determination of arsenic, copper, mercury, nickel, selenium, calcium potassium, chromium, lead, manganese, zinc, aluminium, antimony, cadmium, barium, sodium, magnesium, phosphorus, cyanide and fluoride.

In addition, a new method for the colorimetric determination of phosphorus and the direct determination of cyanide in the presence of thiocyanate, ferrocyanide and ferricyanide were briefly mentioned.

PROGRESS OF HÜLS NEW PLANT PROJECTS

IN THE ANNUAL report of Chemische Werke Hüls AG, Marl, Germany, it is stated that production ran smoothly during the period under review. Total output throughout the company's plants has been raised to the limit of available capacity.

Increased use of liquid gas (C_3/C_4 hydrocarbons) as a raw material is reported to have proved its worth. The new tube furnace plant in which ethylene is produced from the C_3/C_4 hydrocarbons is stated to be particularly valuable and, moreover, the company's requirements could always be met as a result of this plant.

Ethylene consumption increased markedly following the rise in the output of ethyl benzene, and the coming into operation of the direct oxidation plant for ethylene oxide. This plant has also eased the chlorine position for the company. Increased demand for ethylene oxide at the end of the financial year has been met by continuing to run the old installations as well. Benzene consumption rose and further increases in use are expected.

Tetrapropylene Benzene

New plant which went into operation towards the end of the year was for production of tetrapropylene benzene, as a new intermediate for Marlon. Quality of the product has improved and production is stated to be more economic. Also, polyvinyl chloride suspension is being manufactured in a new plant.

During the past year, Chemische Werke Hüls have invested DM 73 million (approx. £629,000) in new plant. DM 39.2 million (approx. £337,000) has been spent on manufacturing plants. Auxiliary and general installations, laboratory, technical centres, etc., took DM 26 million (approx £224,000). Included in the company's investment programme were: Rationalisation of the production of its key products—acetylene, ethylene, hydrogen and chlorine; plant for the production of ethylene oxide by direct oxidation; extension of the vinyl chloride plant, p.v.c. plant and processing installations; plant for the production of octylic phenol and polythene (experimental plant); plant for production of tetrapropylene benzene; silo for sodium sulphate; and a laboratory skyscraper (interior partially completed) etc.

Hüls, which have provided 50 per cent of the initial costs of Bunawerke Hüls GmbH, the synthetic rubber subsidiary, have also provided the land. The plant is to have an annual capacity of 38,000 tons of butadiene and 45,000 tons of synthetic rubber. Total costs are likely to amount to DM 170 million. (£1,500,000 approx.)

Investigations have been carried out on high polymers, such as polythene, polyolefines, polydiolefines and some mixed polymers. Research has continued on the oxidation of saturated and unsaturated hydrocarbons and acrylonitrile chemistry.

Research has continued into the possibilities of manufacturing Hüls intermediate products hitherto based on acetylene, on an olefine basis. Laboratory scale investigations have also proceeded for production of acetylene and ethylene from hydrocarbons, including crude oil, by thermal and electrical processes. Manufacture of acetylene and ethylene on an industrial scale by thermally cracking liquified gas in high-temperature combustion gases has begun. Production plans for vinyl pyridine, dichlorethane, acrylic esters and acrylonitrile derivatives and terephthalic acid on a commercial scale are continuing successfully, as also for sulphonated alkyl benzene with sulphur trioxide and to produce polythene and cold rubber.

Turnover figures for plastics, plastic auxiliaries and plasticisers in the home market were satisfactory and exports were higher than for the previous year. The export ratio was 36 per cent compared with 33 per cent in the previous year. Excess capacity has led to severe competition, however. Polystyrol (Vestyron) supplies have not been adequate for home and export markets. Polyester resins (Vestopal) are now being marketed.

Buna rubber sales were lower than the 1955 figure due to fluctuations in natural rubber prices. Increased quantities of mixed polymerides were sold inside and outside Germany.

Turnover in solvents and synthetic resins (lacquer raw materials) rose markedly with exports taking an appreciable share in the increase. The limited quantities of chlorinated hydrocarbons available were disposed of without difficulty. Sales of detergent raw materials are reported as having developed satisfactorily. Sales of basic chemicals and intermediates for textile auxiliaries were also satisfactory. Turnover for glycols and ethylene oxide derivatives was greater than in 1956, but it is suggested that for organic acids and products, it could be raised. Sales of inorganic products and carbon black were balanced by increased production.

Increased sales of hydrogen to neighbouring nitrogen plants are reported. Due to Hüls own oxygen requirements, sales of this gas dropped slightly. In spite of rising costs, the selling price of alcohol has been maintained.

Abroad, Hüls' Quimica Industrial Huels do Brazil Ltda., Sao Paulo, Brazil, founded on 3 December, 1956, is to begin the erection of a plant at Cubatao for the production of 10 million lb. of monostyrol annually. Turnover of Chemische Werke Hüls for 1956 rose by 11.7 per cent compared with 1955, and amounted to DM477.4 million. Net profit for the year amounted to DM9.6 million. A dividend of 8 per cent is to be distributed.

Provision for funds for new plants, research, experiments and participations are stated to have proved a considerable strain on the company's financial resources. Additions to fixed assets have been largely financed by way of depreciation. (Depreciation — straight line, DM13.7 million (approx. £118,000); reducing balance, DM29.6 million (approx. £246,000); and special, DM13.0 million (approx. £120,000)) and loans.)

KNAPSACK'S ACRYLONITRILE PLANT IN PRODUCTION NEXT YEAR

KNAPSACK-GRIESHEIM AG are erecting an acrylonitrile plant at Knapsack, near Cologne, Germany, and hope to start production early next year at a monthly rate of 600 tons. Like the company's chloroprene—production of which began earlier this year and now amounts to 300 tons a month—most of the acrylonitrile will be supplied to Farbenfabriken Bayer AG under long-term contracts. Bayer are already using Knapsack chloroprene for making neoprene synthetic rubber and will make Dacron fibre from Knapsack acrylonitrile.

Plans have been made for extending the chloroprene and acrylonitrile capacity, but Knapsack-Griesheim have no intention of processing these materials themselves. The experimental work on the production of magnesium has advanced sufficiently far to start on commercial production plans, but a decision on the location of the magnesium plant has not yet been taken.

Some concern is being felt by the company, which now uses about 1,700 million kWh of electric power, at the rising cost of electricity, and in particular at the wish of the lignite industry that the price of lignite-derived electricity should be brought into line with the calorific equivalent of coal-derived electricity. The higher price of coal will also be felt by the company. Knapsack-Griesheim are therefore, as director-general Dr. Ritter announced at a press conference on 26 September, examining opportunities for increased use of petroleum derivatives from the oil refineries now being built on the Lower Rhine and the development of processes using less electricity. Following the success of the first fully-enclosed 40,000 kW carbide furnace, the company are now erecting another modern furnace, not to provide additional capacity, but to replace older furnaces.

Sales this year have been about 10 per cent above the 1956 level, largely, it appears, as a result of starting a second phosphorus furnace last year.

ICI Open New Pharmaceutical Labs

Aerial view of the new Alderley Park laboratories

Research Buildings and Equipment at Alderley Park Cost over £1 million

THE NEW pharmaceutical research laboratories of Imperial Chemical Industries at Alderley Park, Cheshire were opened on Tuesday by Lord Waverley, a director of the company and chairman of the Port of London Authority. Equipment and buildings have cost 'well over £1 million', but it is claimed that these new chemical and biological research laboratories are the most advanced of their kind in design and construction. More than 400 people will be employed of whom 100 are University graduates representing different scientific disciplines.

This pharmaceutical research division which has been steadily built up from the nucleus established 21 years ago within the ICI dyestuffs division in Manchester is expected to expand in several directions although a great increase in staff is unlikely. The company expects that chemical research and biological investigations should be more productive by virtue of the increased facilities and better working conditions. The research chemists, of this division in particular, are now all together, thus saving the time previously spent in travel (up to 20 miles to attend meetings).

Over 10 years' of planning has gone into the construction of the new laboratories which incorporate the best of research establishments of institutes, private companies and Government departments of all over the world. A revolutionary feature of the laboratories is an animal breeding centre designed to breed disease-free animals, which will come into operation in January next year. Construction of this unit has cost nearly £250,000. Research effort both in this country and abroad has been hampered considerably by the common infections found in commercial stocks of laboratory animals. In tests which of necessity must be carried out over long periods, so many animals suffer or die from their own natural infectious diseases that many costly experiments in terms of the salaries of highly-skilled staff, laboratory facilities, are wasted. The division therefore plans to take the unborn animals by Caesarian section (i.e. sterile birth), raise them artificially in a sterile atmosphere, and breed from these animals stock free of their natural diseases, an undertaking which represents the most advanced thinking in the field of biological research in the world.

At the laboratories the work is divided into broad fields—the chemical synthesis of potential drugs and the study of their potential properties. Some 2,500 such compounds are synthesised each year, and one floor of the chemical block has been devoted to keeping all records of these compounds.

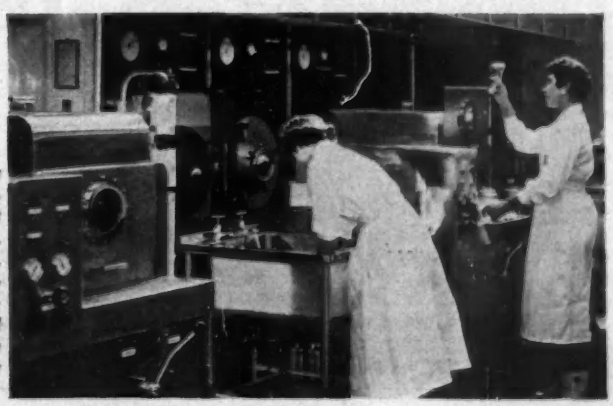
Chemical compounds are being synthesised by the division in a planned fashion, with those designed for a specific purpose giving the most productive end-products. In the development of such compounds, senior chemists and biologists hold frequent meetings.

Included in the chemical laboratories are a microanalysis laboratory, a synthetic chemistry laboratory, and a special autoclave laboratory with separate cubicles for autoclaves and hydrogenators. These articles are designed to eliminate any hazard of explosion and reactions are remotely controlled. Particular attention has also been paid to the safe handling of highly toxic or dangerous chemicals or gases, reactions with such chemicals or gases being carried out in the toxic laboratory. This section is equipped with easy-to-work-in fume cupboard benches, protected by wire glass.

A special laboratory has been set aside for radiochemical investigations. Chemical compounds containing radioactive elements can be synthesised here without risk of contamination.

A feature of the large-scale laboratory where chemical preparations may be carried out on a larger scale than is possible in the ordinary laboratories, is that the whole area is flame-proof. It is in this laboratory that material for clinical trial is produced and preliminary investigations for scaling-up can be carried out. A particular advantage of this large-scale laboratory is that with research records easily available to it, difficulties encountered in pilot plant or final plant can be further investigated. Designed to meet requirements for specialised apparatus which is only occasionally required by any one section, is, as its name implies, the general purpose laboratory. It also services the large-scale laboratory.

One laboratory has been set aside for experiments involving enzyme reactions, separation of natural products and general biochemical techniques. Located nearby is another laboratory which houses infra-red spectrometers and facilities for other physico-chemical work. A special dark room is available for experiments requiring subdued or controlled lighting. Optical instruments, including a projec-



All glassware used in the laboratories is sent to a central department for washing. In the background are the double entry sterilisers through which all infected glassware must pass before processing

tion microscope for particle-size analysis, are located in this room. A gadget of some interest also placed here simulates shake-up of suspension during road transport.

An ICI-designed instrument in the pharmacodynamics laboratory analyses paper chromatograms of compounds labelled with radioactive carbon, sulphur or phosphorus. A recording drum turning at the same speed as the paper chromatogram, records geiger counter impulses at set intervals of time. A memory unit is incorporated in the instrument, which stores up impulses. Other laboratories are those denoted to pharmacology and pathology.

Centrally placed among the laboratory blocks is the wash-up unit and store. This receives used laboratory glassware for sterilisation, washing, storage and reissue. At the close of each day's work, the unit aims to have in store twice the average day's consumption of clean glassware, thus catering for anything but the most abnormal demands. The layout is designed to ensure a continuous operational flow. Dirty glassware enters through autoclaves situated on one wall of this section which are varied in size, one taking very large pieces of apparatus. The dirty but sterilised glassware is then washed, dried, and where necessary sterilised, and sent to the general store.

As part of this unit there is a 'kitchen' which produces the various common media required for bacterial growth, and for which the basis is meat broth.

Biological Laboratories

The biological laboratories display some unique features. Keyword of their design is flexibility in the type and positioning of equipment. Laboratory furniture, instead of being fixed, can be moved at will to suit the needs of the individual worker. The usual services in each laboratory (electricity, gas, vacuum, compressed air, and water) clearly indicated by a colour scheme, are repeated at five-feet intervals along the dividing walls and are also laid under the centre of the floors; the latter are readily tapped through optional removable service pedestals. On some walls there are also outlets for cylinder gases; the cylinders are not brought into the laboratory but are housed and connected to the outlets in cupboards outside in the corridors.

Windows of the biological laboratories are double; the outer window can be opened for cleaning but the inner window of a single sheet of plate glass is permanently closed. Between the two there is a heating coil and venetian blinds remotely controlled.

Much thought has also gone into the design of the experimental animal houses. Vermin-proof barriers at stragetic points ensure security from wild rodents and even cockroaches, while the verandahs are screened with wire against the entry of birds. Other requirements have influenced the design of the infectious diseases animal house, such as the avoidance of cross-infection and dangers to personnel. Clothes changing routines, in decontamination locks and the use of colour codes play essential roles

The other animal house caters for non-dangerous infections and also serves the laboratories dealing with pharmacology, physiology, parasitology and pathology. Special rooms have been adapted for special studies in connection with water snails (carriers of schistosomiasis) and mosquitos.

Some 30 to 40 disease projects are on the ICI pharmaceutical research programme for which a yearly budget of £500,000 (plus or minus 5 per cent) is planned. Long term projects devolve upon virus (flu', poliomyelitis and the common cold) and cancer research. Moderate term projects are tuberculosis and leprosy. The company are continuing to concentrate upon the protozoal infections such as malaria and trypanosomiasis. Suitable compounds for the treatment of amoebiasis are also being sought.

A particularly difficult project which is engaging ICI is the prevention of schistosomiasis arising from the presence of contaminated water snails in such parts of the world as West Africa, Egypt and Iraq. Other conditions for which better compounds are being sought include epilepsy, blood-pressure, hay fever and rheumatism. Research is also continuing in the search for suitable sedatives, hypnotics and anaesthetics.

Managing director of the pharmaceuticals division is Mr. E. D. Carey and Dr. W. A. Sexton is the research director; Dr. J. Yule Bogue is director of the division. Other personnel associated with the division are: Dr. F. L. Rose, research manager, chemical group; Dr. H. C. Carrington, head of synthetics organic section, chemical group, research department; and Dr. D. G. Davey, head of parasitology section; Dr. E. Weston-Hurst, head of micro-organismal diseases section; Dr. A. Spinks, head of pharmacology section and Dr. D. W. F. Wheater, head of bacteriology unit in micro-organismal diseases section, all of the research department.

The architect of the laboratories was Mr. H. M. Fairhurst, and the main contractors were John Laing and Son Ltd. Laboratory furnishings were supplied by Armstrongs (Hull) Ltd., Terry Street, Hull Hull.

Symposium on Irradiated Foods

RADIATION-preserved food is not likely to be seen in the shops for some time. This was the summing-up of the symposium on irradiated foods held at Cambridge on 26 and 27 September. When researches are completed there seems no doubt that irradiation will provide cheap, wholesome, attractive and safe food.

Methods of producing radiation were described. Both electron generators and radioactive sources have their uses and in this sphere Britain is not behindhand.

About 100 British scientists and 20 from overseas attended the symposium. They included the two main groups which are carrying out investigations in the UK —the Low Temperature Research Station of the Department of Scientific and Industrial Research and the Technological Irradiation Group of the Isotope Division of Harwell.

Tolerances for Trade Weights

The Board of Trade propose to revise the tolerances laid down in the Weights and Measures Regulations (SR & O 1907/698) for weights in use for trade purposes. The proposals cover weights of the avoirdupois, grain, troy, apothecaries, metric and metric carat series. Details of the proposed revised tolerances may be obtained from the controller, Standard Weights and Measures Department, Board of Trade, 26 Chapter Street, London SW1.

W. J. Bush in Helsinki

Among the 500 British manufacturers exhibiting at the Helsinki Trade Fair, which closed two week's ago, was the aromatic, fine and pharmaceutical company of W. J. Bush and Co., London E8. They report that the Finns showed a great interest in the exhibits, and an all-time attendance record in the main Helsinki exhibition hall was achieved.

Leather Chemists Hold 60th Annual Meeting

ANNUAL conference of the Society of Leather Trades' Chemists was held at Leeds University last week. Dr. Lionel Goldman, president of the society, which was celebrating its 60th anniversary this year, said that apart from one meeting in London, they had met in Leeds for 14 years in succession.

The anniversary lecture was given by Mr. K. B. Ross, director of operations in the industrial group of the UK Atomic Energy Authority who spoke on the development of atomic energy. Other lecturers were: Dr. W. S. Short and Dr. G. A. Mittler (Yorkshire Dyeware and Chemical Co. Ltd.); Dr. J. P. Danby and Mr. J. F. Shillito (National Leathersellers' College, London) and Dr. D. E. Hathway (British Leather Manufacturers' Research Association).

Obituary

DR. K. W. YOUNG, division development commercial and technical director, ICI Ltd., died while on holiday in Austria. He joined the ICI at the synthetic ammonium and nitrates (now Billingham) division in 1929, served at the Cassel Works of general chemical division for six years and became departmental works manager at the Pilkington-Sullivan Works. At the end of the war he was seconded to the Allied Control Commissioner (chemical industries branch) in Germany for 16 months. He returned to Liverpool in 1946 to take up other important duties.

Will

MR. WILLIAM LANDER, M.P.S., of 45 Leopold Street, Derby, former director and works chemist of F. W. Hampshire and Co. Ltd., manufacturing chemists, Derby, who died on 17 June last, left £23,596 15s 6d gross, £23,522 8s 3d net value.

Overseas News

NOVEL US HIGH TEMPERATURE GAS CHROMATOGRAPHY UNITS

AT THE International Syposium on Gas Chromatography held at end of August and sponsored by the analysis instrument division of the Instrument Society of America, Herman R. Felton of E. I. du Pont de Nemours and Co., reported a novel high-temperature gas chromatography unit.

A gas-liquid partition column containing a silicone grease as the partitioning medium was used, and a novel detector which employed model airplane 'glow plugs' as sensing elements was stated to permit operations at temperatures in excess of 550°C.

According to Felton, mixtures boiling over 400°C can be analysed by the unit.

High molecular weight fluoroesters of camphoric acid (b. pt. 320° to 460°C) were analysed 'with good precision' at column temperatures of 300° to 350°C. Analytical separation of α - and β - N - phenylnaphthylamines was accomplished at 370° to 400°C.

B. W. Taylor of the Fisher Scientific Co., US, also described a new gas chromatographic instrument which was stated to combine a wide temperature range with high sensitivity and operating stability.

Rapid vaporisation of high boiling materials at temperatures up to 400°C is accomplished by means of a modified sample injection system. An integral cooling system gives controlled operating temperatures below the ambient and enables the operator to change temperatures rapidly between runs. Independent thermal control of the chromatographic column and thermal conductivity cell allows the operating temperature to be changed during an analysis without affecting the recorder base-line. High operating stability throughout the greatly increased temperature range is claimed to have been achieved by the use of advanced electronic design in the temperature and power supply regulation.

Increase in Exports of US Synthetic Rubber

According to reports US synthetic rubber exports are expected to remain at high levels, despite the lower prices for natural rubber. For the first seven months of this year exports are said to total 117,734 long tons compared with 87,841 tons in the same period in 1956. Estimates for the full year's exports suggest more than 200,000 tons (150,000 tons in 1956). Should conditions prove less favourable than at present, however, such as shortage of dollars, US authorities believe that major consuming countries might well turn more to natural rubber, particularly in view of recent price declines, and thus adversely affect US synthetic rubber exports.

Shipments of styrene-butadiene rubber have shown the greatest increase in recent months; exports totalling 92,239 long tons compared with 112,336 tons for the whole of 1956 and only 11,069 tons in 1954. Exports of the more special synthetic rubbers, Neoprene and butyl rubber, for the first seven months of this year total 16,980 long tons and 4,700 tons respectively.

New Polish Soda Plant On Stream Soon

Production should start in October at the newly built soda combine at Janikowo, near Inowroclaw, Poland. Production will be based on local raw materials, salt from the Solnia mine and limestone from Piechcin and Wapienna. At present some 500 workers, mainly engineers, technicians and administrators, are engaged in preliminary testing, but when actual production starts the combine will employ a further 1,000 local workers.

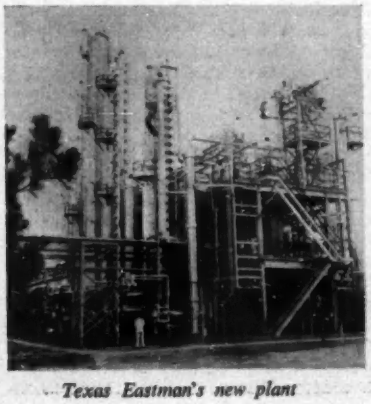
In the first year of working, 400 to 500 tons of calcined soda should be produced daily, and later this figure is likely to rise to 500 to 1,000 tons. The greater part of production is destined for export.

Indian Exemptions from Import Duty

The Indian Government has exempted from import duty radioactive isotopes of iodine, phosphorus and cobalt and all chemical compounds containing such radioactive isotopes.

New Glycol Plant Opened in Texas

Neopentyl glycol in truck load quantities is now being produced by the US company of Texas Eastman Co., from their new plant in Longview, Texas. Interest in this new 5 carbon glycol has centred around the unusual stability of its uniform molecular structure. Polyester plasticisers of only moderate weight made from it are claimed to exhibit extreme hydrolysis resistance and very low order of migration to other materials.



Texas Eastman's new plant

The new plant has been designed for a capacity of several million pounds of neopentyl glycol a year, at a price of 37 cents a pound: during development stages it was marketed at 45 cents a pound.

Large Norwegian Investment Programme Planned

One of Norway's largest industrial companies, Norsk Hydro, has planned an investment programme for the next six years involving an expenditure of about Kr350 million (£17.5 million). Some Kr250 million (£12.5 million) will be invested in regular industrial plants and Kr80 million (£4 million) will be used for the construction of hydro-electric power plants. Production at the company's calcium works at Eidanger, which will have an annual output of 25,000 tons, will start in 1958.

UK Agencies Sought

Internatio Rotterdam (South Africa) (Pty.) Ltd., P.O. Box 3980, Johannesburg, seek UK agencies for various fine chemicals and pharmaceuticals. They are only interested in purchasing in bulk and would not be prepared to buy either chemicals or pharmaceuticals which have been packed. The particular items in which they are interested are potash, chloroform, mercury, quinine, theophoylline, INH, PAS sodium, PAS acid and nicotinimide.

New Synthetic Route to Durene

Research workers of the Shell Chemical of the US have produced a synthetic route for the aromatic durene (1, 2, 4, 5-tetramethylbenzene). The company believe that synthesis could provide the key to greater commercial use; at present the use of durene is limited to making pyromellitic anhydride for use in cross-linked epoxy resins.

The new synthetic route involves methylating low boiling aromatics to the proper 1, 2, 4, 5 arrangement. As a first step to commercial exploitation Shell Chemical have started to make durene on a pilot plant scale.

Swiss Chemical Exports

Chemical exports in Switzerland show an upward trend, these now ranking third in the country's total exports. In the first half of this year, chemical exports increased to 17.9 per cent of all exports, valued at Sw. Frs. 562.5 million (£46.2 million), compared with Sw. Frs. 1013.3 million (£83 million) for the whole of 1956, when chemicals accounted for 16.3 per cent of total exports. Only 7 per cent of the chemical industry's production is taken by the home market.

Soda Plant for Chile

Corporacion de Fomento de la Produccion, the Chilean State enterprise for the promotion of new production projects, has signed contracts for the erection of a soda plant at Tarapaca, Norte Grande. The new plant is to start production by 1960 at the latest and to reach

its maximum output of 65,000 tons a year by 1962.

CORFO has been working on plans for a soda plant for several years, and the decision to set up a new factory was taken late in 1955 but apparently not acted upon until now. The plant now to be erected will employ the Solvay process. Planning and supervision of the construction work is in the hands of Techint Engineering Inc. and Chemiebau Dr. A. Zieren, a German firm, and the technical equipment will be supplied by Allgemeine Elektrizitäts-Gesellschaft of Frankfurt, Germany, in conjunction with an Italian group led by Ansaldo of Genoa.

Of the capital of the company to be founded for operating the soda plant, initially 2,500 million pesos (approx. £1,315,700), CORFO will provide 60 per cent and private interests 40 per cent. The German-Chilean trade agreement signed on 2 November 1956 provides for encouragement of German capital investment and technical aid in Chile.

Spanish Directions Required for Insecticides

Under Presidential regulation 2089 which regulates the cultivation and ginning of cotton in the Dominican Republic, all insecticides and fungicides for use in combating pests and diseases in cotton must bear directions for their use printed in Spanish. This applies to imported as well as to locally-produced goods.

Changes in Australian Customs By-Laws

The following chemicals and drugs will be admitted under the Australian by-law tariff free of duty (British preferential rate): acetylcholine chloride; allobarbitone; buclizine; chloramphenicol intramuscular; chlorohydroxyquinoline; chlortetracycline; choline theophyllinate; dibucaine; dicyclomine; hydrocortisone, hydroxyamphetamine and phenylephrine combined; mephentermine; methylamino methylheptane and isoamylamino methylheptane, combined; nystatin; oxeladin; oxytetracycline; pipradrol; polymyxin B; secretin; triodothyronine.

Dow to Make Linear Polythene

Linear polythene will be produced at the Bay City, Michigan, US, plant of the Dow Chemical Co. The new production facility will go on stream in October 1958.

The new plastic will be produced under licence by the Ziegler, or 'low-pressure' process and will be available as powder and granular material in its natural white and coloured formulations. The product has had two years of extensive pilot plant preparation and is reported to have met with favourable customer reaction.

Dow have been producing high-pressure polythene in their Texas division for more than two years.

German Process for High Quality Sulphuric Acid

A process has been developed by Concordia Bergbau AG, Oberhausen, Germany, which is stated to produce high quality sulphuric acid from coke oven gas. According to the company the acid can be obtained at a little over $6 (£2) a ton.

Coke oven gas is washed with ammonia in an aluminium tower to recover the hydrogen sulphide present in the gas. The hydrogen sulphide is then converted into sulphur trioxide by means of a vanadium catalyst. The sulphur trioxide is then converted into 99.9 per cent pure sulphuric acid by means of a condensation and pressure filtration process.

Concordia Bergbau AG, claim that the process is highly efficient, some 80 per cent of the hydrogen sulphide present in the gas being converted to sulphuric acid by means of the ammonia treatment.

Methane Consumption by Italian Chemical Industry

Figures showing the use of methane in the Italian chemical industry were given by Professor Luigi Sessa during the Technical Congress on Methane (Piacenza, 12 to 22 September).

In 1956, over 203 million cubic metres of natural gas (about 62 per cent of the methane used by Italian chemical factories) were used for the production of synthetic ammonia. Ammonia produced amounted to 213,700 metric tons, about 44 per cent of the total Italian output.

A further 126 million cubic metres of methane were used for the production of nitric acid, colouring substances, explosives, nylon, varnishes, resins, methanol (32,327 tons) and its derivatives, and derivatives of acetylene.

Du Pont to Spend Further $4m in Canada

Du Pont of Canada have announced an additional $4 million expansion of their Maitland, Ontario and Kingston plants, making a total of more than $12 million for expansion at these two sites announced within a year.

About $3 million of the latest sum will be spent at Maitland where a fourth boiler and stack will be installed in the power house which serves plant producing nylon intermediates, Orlon and Freon. Process improvements and increased capacity for the production of nylon intermediates are also planned. About $1 million will be spent at the Kingston nylon spinning plant, principally for expanding warehousing and shipping space.

The work will begin immediately, with completion scheduled for December next year.

Welding Titanium to Hafnium

Knolls Atomic Power Laboratory US, claim that good quality welds can be obtained between pure titanium metal and hafnium metal by means of a tungsten arc shielded in an inert gas.

To obtain the best results, the electrical current and speed of welding must be carefully controlled, the laboratory state. The welded joints obtained were found to be harder and stronger than either titanium or hafnium metal due to the fact that alloyed material was formed at the point of welding.

Gas Conservation in Venezuela

Creole, of Venezuela, has opened the largest gas conservation plant in the world at Tia Juana in Lake Maracaibo. By 1960 the company will have invested Bs.600 million in gas conservation. The construction of a lubricants plant, costing Bs.25 million, will be started in August at Amuay. Creole has ordered four 32,000-ton tankers from Japan.

Profit Margins Continue Decline in US but Record Sales Expected in 1958

PROFIT margins of the eight largest US chemical companies declined 10.5 per cent in 1956 and were down another 14 per cent in the first half of 1957. Prices of US chemicals had not kept pace either with rising costs or with prices in other fields. In June, wholesale chemical prices were only 9 per cent above the 1947–49 average, compared with 17 per cent for all manufactured goods prices.

These facts were stated by Mr. John O. Logan, vice-president and general manager of the industrial chemicals division of the Olin Mathieson Chemical Corporation at a recent New York marketing conference. They were the basis of his prediction that US sales of chemicals and allied products would increase by 5 per cent in 1958.

For the first half of 1957, sales were about 4 per cent ahead of 1956. If industry expectations were met during the second half, the year's sales would total $25,000 million, 'a continuation of new yearly highs set by chemicals since 1937 with the exception of two years—1949 and 1952'. The prospect for extension of that trend into 1958 was good. General business appeared to be headed for a 'plateau' in 1958. Other reasons were that customer stocks were at a low level; some industries which had slumped in recent years showed signs of moderate recovery; the chemical industry's record capital expenditure of the past two years should stimulate sales and development of new markets; and an anticipated increase in prices.

Mr. Logan spoke of the industry's record capital expenditures for new plant in 1956 and 1957, which would total about $3,300 million, or 13 per cent of annual sales. The 'rule of thumb' in the chemical industry was that $1 of new plant would generate about $1 of annual sales. On that basis, capacity of the chemical industry would exceed estimated sales by about 15 per cent at the end of 1957; by the end of 1958 capacity would have risen to a level about 25 per cent above 1957 sales.

Products that should benefit from new markets in 1958 were cited as polythene (pipe), synthetic rubber (car springs), lithium and boron compounds (high energy fuels) and urethanes (paints). In addition synthetic fibres and plastics should continue to extend their general field of uses.

USSR Develop New Resistant Glass for Chemical Apparatus

Work of Soviet Scientists Described

A NEW TYPE of heat-resistant glass for certain kinds of laboratory glassware is claimed and described by S. K. Dubrovo and Yu. A. Shmidt in *Zhurn. Prikladn. Khim.* 1957, **30** (4) 501. Heat-resistant glasses generally and those hitherto used in the Soviet Union, including three groups differing in temperature range and coefficients of expansion (total range 90° to 210°C), are prefaced, together with some details of composition and a brief account of work in other countries. The present work was undertaken to improve both heat resistance and chemical stability, especially under acid conditions.

Attention was directed chiefly to non-alkaline alumino-silicate systems, and some previous Soviet research on the effect of individual oxides on the coefficient of expansion was studied.[1] (The most effective in lowering the coefficient of thermal expansion are zirconium dioxide and aluminium oxide.) However, the development of new systems for glass could not be based solely on this characteristic and it was necessary to take into account the whole complex range of technical requirements in relation to physico-chemical properties. Favourable melt properties were determined by the position of the component on the diagram of state in the region of the low melting point eutectic. Among the non-alkaline alumino-silicate systems the lowest melting point eutectics were those of systems containing calcium oxide. Therefore, although calcium oxide raised the coefficient of expansion more than the oxide of magnesium or of zinc, it nevertheless was a usual constituent in the composition of alumino-silicate glasses.

Extremely Tough

The tests undertaken with non-alkaline and non-boron alumino-silicate glasses showed that they were extremely tough and strong with a very high initial softening point (above 700°C), thus making it difficult to work them into laboratory glassware. This induced the authors to use calcium fluoride as a flux together with small amounts of alkali.

Special tests were made to study the effect of lithium oxide and calcium fluoride. Up to a limited content they were found to have a favourable effect.[2] Glasses were accordingly made from the system CaO-MgO-Al_2O_3-SiO_2, with addition of small amounts of lithium and sodium oxides (2 to 3 per cent), and with replacement of part of the calcium oxide by an equi-molecular amount of calcium fluoride. In some cases up to 2 or 3 per cent of boron oxide was included.

For all the glasses temperature of initial softening, chemical stability, and coefficient of linear expansion (20° to 400°C) were determined; also viscosity by torsion viscometer with automatic recording, and crystallising power. Initial softening point was found by heating glass rods (about 2 mm. diam. and 125 mm. long) in a muffle at the rate of 1°/min., and the coefficient of linear expansion with the aid of a dilatometer by the GIKI method (Glass and Ceramic Inst.).[3] Chemical stability was determined mostly by the powder method, and in some cases by that described in the relevant Soviet Standard (GOST) for laboratory ware. In the acid resistance test 4 g. of powdered glass in a quartz vessel was heated over the water-bath for three hours with 50 m./lit. of 1 n sulphuric acid;[3] including the amounts of SiO_2 and Al_2O passing into solution (by colorimetry).

It had previously been established[4] that addition of aluminium oxide (to sodium silicate systems) above a prescribed limit worsened their acid resistance. This was further investigated with new alumino-silicate systems in which the silica content was at least seven times that of the alumina. The glass was melted, at first in small quantities, in a platinum crucible over reactive materials, and its physico-chemical properties then studied. Those showing the most favourable properties were further tested by melting on a larger scale (in 3-litre and 100-litre pots). The raw materials used included: Vodolazh sand or marshalite, alumina, chalk, magnesium oxide, fluorspar, soda, and spodumene concentrate (to supply Li_2O and containing 4 to 4.2 per cent thereof).

Various melts were prepared as shown in Table 1:

Glasses T-7 and T-31 were melted in 3 l. crucibles at 1480–1490°C for 14 to 16 hours; T–16_1 and T-12 in 100 l. chamotte pots at the same temperatures for 20 to 22 hours. From these latter two various articles were prepared—flasks and other chemical vessels. T-16_2 and T-28 were melted in a small tank furnace of 2.5 tons capacity in a glass-works, and experimental glassware also prepared therefrom.

The physico-chemical properties of these glasses are tabulated (Table 2) including also those of a particular borosilicate.

As may be seen from the table the authors' alumino-silicate glasses have a higher softening point than a borosilicate type. In thermo-stability they are somewhat inferior but yet have a coefficient of expansion below 50.10^{-7}./deg., within the limits of 20° to 400°C, so that they may be ranked among the glasses of high thermal stability. This was confirmed by numerous tests according to the relevant GOST for borosilicate glass and under conditions of use in various chemical laboratories. Chemical resistance is not inferior to that of borosilicate glass. As compared with borosilicate glasses, the alumino-silicates, are distinguished by their unique temperature/viscosity curves. They have much lower viscosity in the high temperature range, and at relatively low temperatures the viscosity increases sharper than with borosilicates. This facilitates melting of these glasses, but makes their working in the burner flame more difficult.

Crystallising Characteristics

Besides the above properties crystallising characteristics were studied, with those of borosilicates. In a graduated furnace in the temperature range 750–1300°C for six hours, with the following results: With the T-12 and T-28 samples crystallisation in the form of a slight surface film was noted at 850–870°C. Between 950° and 1150°C the film thickened to 0.1–0.2 mm., after which it was scarcely visible. From 1180°C and upwards the glass had a bright surface. Glasses with a high fluorine content (T-7, T-16 and others) became opalescent

TABLE 1

Constituent	T-7	T-16_1	T-16_2	T-12	T-31	T-28
	Composition in mol. per cent					
SiO_2	71	71	71	71	71	72
Al_2O_3	10	10	9	8	9	9
B_2O_3	—	—	—	3	2	3
CaO	4	4	6	8	6	5
CaF_2	7	7	5	2	4	4
MgO	6	6	6	6	6	4
Na_2O	—	1	2	—	—	1
Li_2O	2	1	1	2	2	2

TABLE 2

Property	Borosilicate	T-7	T-16_1	T-16_2	T-12	T-31	T-28
Softening point °C.	620	660	680	650	670	680	645
Coeff. lin. expan. 10^{-7}	36.0	44.6	45.6	50.4	44.2	43.6	46.3
Density	2.25	2.47	2.5	—	2.45	—	2.41
Chem. resistance by the powder method:							
Acid resist. (in 1 n H_2SO_4) loss in wt. in mg.	—	2.0	2.4	—	—	1.9	1.6
SiO_2 in soln in mg.	—	0.81	0.9	—	0.69	0.66	0.6
Al_2O_3 in soln in mg.	—	1.03	1.5	—	1.9	0.99	0.75
Water resistance (in ml.) 0.01 n HCl	—	—	0.02	—	0.14	0.11	0.16
Chem. resist. by Soviet standard (GOST), i.e. loss in wt. in mg./100 cm^3 on boiling in distilled water	0.5–1.0	—	0.7–0.9	0.6–0.9	0.2	—	0.4
1 n H_2SO_4	0.3–0.5	—	0.7	0.5–1.0	0.4	0.8	0.3–0.6
2 n NaOH	89–93	73–75	—	75–79	88	86	79–83

in the 725–750°C range, but above 1180°C they were transparent. With borosilicate glasses it was noted that, at about 650°C a crystalline film appeared, reaching a thickness of about 0.5 mm. in the range of 700–1020°C; after which, up to 1130°C, the thickness of the film decreased. In the range of 1130–1280°C the film was scarcely noticeable, and above 1280°C the glass was again quite transparent. Thus, this glass crystallised in a larger temperature range than the above-described alumino-silicate glasses.

From the foregoing it was concluded that low-alkaline non-boron or low-boron alumino-silicate glasses belonged to the high thermal stability class. In chemical stability they have not proved inferior to borosilicate glasses. Their temperature/viscosity relation indicated the possibility of melting these glasses and of manufacturing articles therefrom under similar industrial conditions to those of borosilicate types, as has been confirmed with T-16 and T-28 samples. These still, however, cannot replace the former for many kinds of laboratory ware; but they would provide a useful material in cases where repeated manipulation in the burner flame is not required, as with flasks, etc.

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US Radiation Laboratory Develop Liquid Hydrogen Bubble Chamber

THE US National Bureau of Standards is assisting the University of California radiation laboratory in the development of a liquid hydrogen bubble chamber more than 60 times as large as any now in use. The bubble chamber is being constructed to operate with the bevatron, the 6,000 million electron volt particle accelerator at UCRL.

Progress in high-energy nuclear physics during the past 20 years has been made possible largely by improvements in particle accelerator design, coupled with corresponding advances in the art of particle detection. The bubble chamber was devised to overcome some of the shortcomings of the cloud chamber, photographic emulsions, and other detection equipment available for high-energy experiments.

It is a vessel filled with a transparent liquid which can be so greatly superheated that an ionising particle moving through the liquid will start violent boiling, initiating growth of a string of bubbles along its path. The bubbles give a clear picture of particle tracks.

Pure liquid hydrogen is an excellent target material for the bubble chamber because it has a high nuclear density at low pressures and its simple nucleus provides elementary particle interactions. At normal atmospheric pressure, hydrogen boils at 20°K. Its critical temperature is 33°K and its critical pressure is 13 atmospheres, above which no liquid phase is possible. For a hydrogen filled bubble chamber to operate successfully, the temperature and pressure must be between these values.

Successful hydrogen bubble chamber operation has shown that for best results the liquid should be maintained in the subcooled state at about 27°K and 6 atmospheres. To make the chamber sensitive to ionising particles, the liquid must be superheated, and this is accomplished by suddenly reducing the pressure to 2 or 3 atmospheres. A significant expansion of the liquid hydrogen volume is required for the superheating operation because of the compressibility of the liquid. After photographs of particle tracks are taken, the cycle is completed by compressing the chamber liquid and returning it to the sub-cooled state.

One-half litre and eight-litre liquid hydrogen bubble chambers have been constructed and operated during the past two years at UCRL. These early successes led to the belief that a very large liquid hydrogen bubble chamber was feasible. Consequently, a chamber having a volume of about 550 litres (15 by 20 by 84 in.) was planned and is now being constructed. It is scheduled for operation early in 1958.

The chamber will have a 20 by 72 in. window which will be 5 in. thick to withstand the 6 atmosphere internal pressure of the chamber.

One of the advantages of the bubble chamber as a high-energy particle-detection device is that it can be pulsed (i.e., superheated) at the same rate as the accelerators. However, this pulsing is irreversible and adds energy to the liquid. Thus refrigeration is required if a constant bubble chamber temperature is to be maintained. The hydrogen refrigerator will utilise the Joule-Thomson process and operate at a pressure of 2,000 p.s.i.g. Superheating the liquid hydrogen in the chamber will be accomplished by suddenly expanding the hydrogen vapour in equilibrium with the liquid. Recompression will take place less than 30 milliseconds later when hydrogen vapour maintained at liquid-nitrogen temperature (77°K) is admitted.

Small bubble chambers have shown the existence of a fusion reaction catalysed by mesons. It is hoped, therefore, that successful operation of the large chamber will make possible a better understanding of fundamental nuclear physics.

Instrument Show

The Fourth International Instrument Show, organised by B and K Laboratories Ltd., 57 Union Street, London SE1, will be held at Caxton Hall, Westminster, London SW1, from 24 to 29 March 1958.

OCCA Lecture on Work Study

THE NEW session of the London section of the Oil and Colour Chemists' Association opened on 25 September. Mr. Winston Rodgers, head of the industrial operations unit of the Department of Scientific and Industrial Research, spoke on 'Principles of work simplification in industry.'

Mr. Rodgers gave particulars of a study made of labour utilisation in a resin plant of a paint manufacturer with a view to suggesting improvements in working methods. Information was gathered by discussion with management and staff and by activity sampling studies.

Recommendations made were (a) a redistribution of duties which would result in an annual labour cost saving of £4,000, (b) portable pumps should be provided to simplify pot cleaning and barrel filling; suitable attachments should be provided for the fork lift truck to facilitate barrel and open pot handling (total cost of such equipment would be approximately £300), (c) the range of resins manufactured should be simplified, which in turn would assist the rapid development of bulk formulae and facilitate longer-term production planning, and (d) method study should precede the installation of any further new plant and equipment.

Maximum Suppressors in Polarography

THE subject of maximum suppressors was discussed at a recent meeting of the Polarographic Society in London. Mr. D. R. Curry, SERL, Baldock, opening the topic, said that polarographic maxima were still the subject of considerable theoretical controversy. They could be removed empirically by the addition of small quantities of substances known as maximum suppressors.

These substances fell into four groups: carbohydrates (e.g. starch, methyl cellulose), proteins (e.g. gelatine), dyes (e.g. methyl red) and detergents (e.g. Triton X). Concentrations used were low (0.002 per cent).

It was stated in the ensuing discussion that the storage life of gelatine could be increased by the addition of a crystal of thymol or a drop of chloroform as a preservative against bacterial action.

Polyethylene glycol 4000 was mentioned as a new suppressor, particularly for organic polarography.

Dinner and Dance

The Royal Institute of Chemistry, London section, is to hold its ninth annual dinner and dance on Friday, 1 November at the St. Ermin's Hotel, Caxton Street, SW1, at 7 p.m. The principal guests will be Professor and Mrs. P. Blackett and Professor W. Wardlaw, RIC president and Mrs. Wardlaw. Applications for tickets, at 30s each, should be made to Miss E. I. Beeching, 16 Chalvey Park, Slough, Bucks.

QVF Canadian Order

This year QVF Ltd., Fenton, Staffs, have delivered orders worth £16,000 for glass pipeline and fittings for the Polymer Corp. at Sarnia, Ontario.

PEOPLE in the news

● The sales director of QVF Ltd., Fenton, Staffs, MR. J. G. WINDOW, left this country on 2 October for a tour of the company's agents in North America. He will visit New York, the eastern seaboard, Toronto and Montreal.

● MR. H. M. BRAID and MR. W. H. GREAVES have been appointed directors of the United Glass Bottle Manufacturers Ltd. Mr. Braid is a director of the Distillers Co. Ltd. and managing director of John Walker and Sons Ltd.; Mr. Greaves is managing director of Tanqueray Gordon and Co. MR. F. COWARD who has relinquished the secretaryship of UGB remains on the board. MR. B. MOORHOUSE has been appointed secretary.

● At the annual meeting of the British Standards Institution held in London on 24 September, the following members of the BSI chemical division were elected to serve on the general council: MR. L. W. BLUNDELL, North Thames Gas Board; MR. F. W. BURMANN, Glasso Paint Products Ltd.; PROFESSOR E. MATTHEWS, Turner Dental School; and DR. K. A. WILLIAMS.

● MR. COLE DOWNING has been appointed technical manager for the Acrilan plant of Chemstrand Ltd., 8 Waterloo Place, London SW1. Mr. Downing, who will take up his duties at Coleraine in the near future, has been projects technical supervisor at the Decatur, Alabama, plant of the Chemstrand Corporation. Before joining Chemstrand he worked with the Monsanto Chemical Co. as a pilot plant engineer.

● PROFESSOR H. S. W. MASSEY, F.R.S., has now arrived in Washington DC to lead the UK delegation at the International Geophysical Year conference on rockets and artificial satellites which is being held from 30 September to 5 October. Other members of the delegation are: DR. J. G. DAVIES, Jodrell Bank Experimental Station, Lower Withington, Macclesfield, MR. W. T. BLACKBAND, Royal Aircraft Establishment, Farnborough, and MR. ALISTAIR ANTHONY, British Joint Scientific Mission in the US.

● MR. P. S. BRIGGS (T. N. and F. H. Briggs, tanners, Leicester), was appointed president-elect to succeed DR. LIONEL GOLDMAN (E. and J. Richardson, Newcastle upon Tyne), at the annual meeting last week of the Society of Leather Trades' Chemists. Officers re-elected were: PROFESSOR DONALD BURTON, hon. treasurer; MR. G. H. W. HUMPHREYS (Forestal Central Laboratories, Harpenden), hon. secretary; and DR. T. WHITE, hon. editor. The following, who have been SLTC members for more than 50 years, were elected hon. life-members: MR. ALLAN GUTHRIE, MR. F. A. BLOCKEY, MR. T. HOUGH, MR. J. A. S. MORRISON and MR. ANDREW TURNBULL.

● The appointment of MR. E. R. ROWZEE as president and managing director of Crown-owned Polymer Corporation of Canada is announced. He succeeds MR. J. D. BARRINGTON, who has resigned to take up the presidency and managing directorship of Ventures. Mr. Barrington will remain on the Board of the Polymer Corporation. New Polymer Corporation vice-presidents have also been appointed. These are MR. L. D. DOUGAN, plant manager, vice-president operations; MR. STANLEY WILK, treasurer, vice-president finance; and MR. ROGER E. HATCH, general sales manager, vice-president marketing.

● MR. T. R. AUCHINCLOSS has been appointed to the board of directors of Domestos Ltd. as technical director. He is succeeded as chief chemist by DR. G. C. GIBBONS.

● MR. EVAN AG. NORTON, deputy chairman of the Monckton Coke and Chemical Co. has resigned from the board.

● MR. E. D. HART, general secretary of the Scientific Instrument Manufacturers' Association is accompanying MR. T. E. REES, managing director of Industrial Exhibitions Ltd., who is touring German and Swiss centres from 30 September to 6 October. The intention is to continue discussion on international aspects of the Instruments, Electronics and Automation exhibition to be held in London from 16 to 25 April next year.

The nucleonics group of SIMA is actively concerned with the second Atoms for Peace exhibition to be held in Geneva during September 1958 and arrangements will be made in that city concerning the proposed participation by 25 to 30 instrument companies.

● MR. EDWARD E. TRANTER, formerly managing director of Sherwoods Paints Ltd., has joined the board of K. W. Chemicals Ltd. on 1 October. He is to direct a new division dealing with raw materials for the paint and allied industries.

● MR. A. C. H. CAIRNS, who since 1953 has been a director of Joseph Crosfield and Sons Ltd. and of William Gossage and Sons Ltd., has been appointed managing director of Unilever Export Ltd., London. For the past four years Mr. Cairns has been director responsible for Crosfield's chemical sales department and has done much to increase exports of chemical products. He is a member of the North-West Regional Council of the Federation of British Industries and an employer member of the Warrington/St. Helens District Committee, North-West Regional Board for Industry. As a member of the technical committee of the British Standards Institution he was concerned with the recent standard on detergents in the dairying industry.

● MR. C. R. G. YOUNG, managing director of Ashe Chemical Ltd. and Ashe Laboratories Ltd., Leatherhead, Surrey, is visiting America. He sailed from Southampton on Thursday last week.

● MR. NORMAN EDWARD HEATH, chief clerk, Midland Tar Distillers Ltd., Queensferry, retired on 27 September after 46 years with the company. He started work at the Queensferry distillery in 1911 when it was operated by Joseph Turner and Co. Ltd. who in 1924 amalgamated with Midland Tar Distillers.

● MR. ROBERT S. COOKE, general manager of the Trafford Park soap works of Thomas Hedley and Co. Ltd. has been appointed works manager of the company's factory at Newcastle upon Tyne. He is 32.

● New secretary of the National Physical Laboratory is MR. H. J. HADOW. Previously Mr. Hadow was Scientific Attaché at the British Embassy in Washington and director of the UK Scientific Mission there since 1954. He joined the Department of Scientific and Industrial Research in 1951 where he was concerned mainly with the research associations.

● MR. T. W. HOWARD, F.R.I.C., chairman of Howards of Ilford Ltd., has been elected chairman of the British Standards Institution's chemical divisional council. This council is responsible for co-ordinating the work and supervising the policy of all BSI activities in the chemical field, which includes standards for adhesives, disinfectants, leather, petroleum, paints, plastics, rubber, scientific glassware, surgical instruments and other products and materials. Mr. Howard is a comparative newcomer to BSI affairs, his introduction having followed his participation in the work of the international standards committee on chemistry (ISO/TC 47). He was one of the British delegates to the meeting of this committee held last year at Sirmione in Italy. He succeeds Mr. G. H. BEEBY, who chaired the chemical divisional council during the past three years.

T. W. Howard

Mr. Howard, a member of the London region committee of the Association of British Chemical Manufacturers, is chairman of the drug and fine chemical group of the Association of Chemical and Allied Employers.

● With the start of the academic year three well-known scientists previously members of the staff of the Shirley Institute have taken up senior university posts. MR. J. J. VINCENT, head of the Weaving Department since 1954, succeeds PROFESSOR

(*Continued on page 570*)

Commercial News

ICI's Profits Up and Group Sales Rise £14 million

UNAUDITED figures of Imperial Chemical Industries Ltd.'s trading results for the first half of the financial year 1957, show that group sales have risen to £235 million compared with those for the corresponding period of 1956 (£221 million). Group income has advanced from £27,255,000 to £30,938,000. Taxation took £14,153,000 (£12,833,000), leaving net income some £2.3 million up at £16,785,000. Depreciation was charged at £11,674,000 against £11,368,000, and the employees' profit-sharing scheme took £1,736,000 compared with £1,578,000.

An interim dividend of 4 per cent has been declared on the £143,045,636 ordinary capital (same). A final of 6 per cent made a total of 10 per cent for 1956.

Trading profits throughout the group benefited in the first half of 1957, the directors state, from the increasing sales of products on which substantial capital has been expended in recent years. Also, no marked change in general trading conditions in the principal territories in which the group operates has occurred since 1 July this year.

Previous statements of half-yearly income by ICI have included trading profits of the home manufacturing divisions and the company's proportion of the trading profits of divisional subsidiaries, but only such dividends as had actually been declared by other subsidiaries at home and overseas. The figures now quoted for the first half of 1957 and comparative figures for the first and second halves of 1956, relate to the present company and all its subsidiaries both at home and overseas.

Fluctuation in the charge for depreciation in the separate half-years (£11,368, 1st half 1956, £12,091, 2nd half 1956, and £11,674, 1st half 1957) is stated to be of no particular significance. It does not result from any change in the principles on which depreciation is charged but from the incidence of dates on which new plants commence operation, old plants cease production, and new assessments are made of the working lines of other plants.

For the purpose of computing the charges, for the first half of 1957, for the employees' profit-sharing scheme and distributed profits tax (both being dependent on the dividend distribution for the year) the same total rate of ordinary dividend as was paid for 1956, i.e. 10 per cent, has been assumed. The directors emphasise that this assumption has no bearing on the rate of final dividend which may be declared for the year 1957.

Amber Chemical Industries

Discontinuance of the size business adversely affected results for 1956 declared Mr. D. G. N. Lloyd Lowles, chairman of Amber Chemical Industries Ltd. at the annual meeting on 27 September. For the six months to 30 June 1957 there was a profit on actual trading of about £7,750. That did not take into account expenditure on research, publicity and development incurred in connection with the industrial chemicals division, which had not at 30 June started selling on a commercial scale.

The disposal of Cubitt Town Wharf left the company with sufficient liquid resources to continue development and expansion on a conservative basis.

Amber Chemical Co. were confident that their range of combustion additives and fuel improvers would gain wide acceptance throughout industry and shipping. Turnover of Amber Oils continued to increase and profits were being earned; Causeway Reinforcement were also making profits. The import-export company of Charles H. Windschuegl had embarked on a policy of planned expansion under new management which had turned losses into profits.

F. W. Berk and Co.

Conditional on shareholders of F. W. Berk and Co. approving the necessary capital increase at a meeting on 16 October, the company is to acquire the £10,000 capital of Leda Chemicals Ltd. and the £100 capital of Lea Valley Chemicals for a consideration of 400,000 ordinary 5s shares and £5,000 in cash. The proposed acquisition will integrate operations in intermediates and will give Berk a direct interest in outlets for new products which Leda and Lea Valley have developed. The Leda factory will provide additional facilities for the company's expansion; it is stated that lack of space is already being felt.

The directors of F. W. Berk consider the purchase price to be commensurate with the value of the assets to be acquired. The net asset value at 18 May was £72,342 and the directors believe that their value to the group is at least £127,000.

The shares to be issued will not rank for the first of any interims declared before 30 November in respect of 1957. It is proposed to create 2,080,000 new 5s shares.

British Chrome and Chemicals

Interim dividend of 6¼ per cent is to be paid by British Chrome and Chemicals (Holdings) Ltd. This dividend is the same as that paid in the previous year. Total dividend for last year was 12½ per cent.

Thomas Hedley and Co.

Record turnover and a substantial rise in operating profits are reported by Thomas Hedley and Co., manufacturers of detergents, for the year ended 30 June.

Before UK taxes, operating profits increased by £500,000 to £1,869,086, although it is stated that these have not fully recovered from the 1954-1955 setback when there was a fall of profits of £514,000 from £2,203,000. After taxation of £917,191 against £613,952, therefore, profit balance is £951,895 compared with £744,500.

All the profits, after tax, have been paid out by the company as dividends, the figure on the ordinary shares being £950,000 (£350,000) and on the 'A' shares £1,294 (nil). This has been done in an endeavour to make up to shareholders for 'a very long inadequate return' over the 26 years since 1930, during which time some two-thirds of taxed profits were retained in the business.

Some £750,000 has been spent on maintaining research. This was in addition to capital expenditure—which increased before depreciation from £6,782,258 to £7,304,801. Outstanding commitments totalled £135,000.

It is reported that improved methods have been responsible for maintaining the 'steady increase' in productivity. The company's export position has also been satisfactorily maintained, and the directors remark that the general situation appears favourable for the continued development of the business both for home and export markets.

Thomas Hedley are controlled by Procter and Gamble of the US. This US company reports profits for the year to 30 June of £48,729,694 (£43,188,818) before tax and £24,216,920 (£21,184,454) after tax.

Reichhold (Australia)

Consolidated net profit of Reichhold Chemical Industries (Australia) Ltd. fell by £9,861 to £245,349 for the year ended 30 June. Dividend is 11 per cent on doubled capital (15 per cent).

Calico Printers' Association

Mention is made in the 1956–57 report of the Calico Printers' Association to the Terylene royalties position. For the first time, income from royalties is shown separately in the accounts and the substantial increase in these (from £293,000 to £521,000) is stated to be largely due to expanding sales of Terylene by Imperial Chemical Industries Ltd., from production in this country. This company's Canadian subsidiary is making satisfactory progress with the product, as also the manufacturing licensees on the Continent, particularly Rhodiacta in France. As a result additional future income is expected by the Association.

When the board of Calico Printers reviewed the effect of the additional revenue from royalties upon the year's results they considered it preferable to recommend a bonus distribution rather than an increase in the rate of dividend paid on the ordinary stock in recent years. This recommendation is influenced by the fact that the exceptional amount of income from Terylene royalties will cease when the patents expire. The board also refer to the further complication in that the British patent, which has so far been the principal source of revenue, cannot yet be extended beyond July 1958.

It is reported by the chairman of Calico Printers' Association that the association is submitting an early application for an extension. In similar cases, states the chairman, applications for extensions of patents obtained during the war have been given favourable consideration.

TRADE NOTES

A special grade of Plasflex synthetic adhesive has been developed by E. W. Edwardson and Co. (Ware) Ltd., for labelling of polythene bottles. It is stated that this adhesive is also suitable for labelling other particularly resistant surfaces such as Cryovac, Pliofilm, etc., and for bonding polythene films and p.v.c. to porous surfaces.

Trading Methods to Change

Servomex Controls Ltd., manufacturers of electronic control systems and equipment, announce changes in their trading methods, taking effect on 1 January 1958. A new world-wide price list will take the place of the present home and export list. New contracts with overseas agents will give increased incentives to sell Servomex designs and hardware, and agency agreements in UK will cease.

The company state that these are the first moves to a more rational trading system, made necessary by the trend toward a true European market.

Fisons Pest Control

The new season's price for Phenoxylene Plus, a highly selective weed-killer, produced by Fisons Pest Control, is now 26s per gallon, a reduction of 7s per gallon. In addition the dosage rate required has been reduced, which will mean a further saving to the farmer.

Pipe in High Impact PVC

Horwitch Smith and Co. Ltd., Pensneth, Brierley Hill, Staffs., have announced a range of Oxythene pipe fittings in sizes up to 6 inch diameter available in high impact p.v.c. This plastic is said to be ten times stronger than standard p.v.c. The company also produce 'V' grade tube, suitable for biological engineering, and 'R' grade tube for normal applications.

Changes of Name

From 1 October, Costain-John Brown Ltd., South Audley Street, London W1, have changed their name to Constructors-John Brown Ltd.

From 1 October, Fina Petroleum Products Ltd., 25 Victoria Street, London SW1, have changed their name to Petrofina (Great Britain) Ltd.

Measuring Instrumeats

From 8 to 11 October, Mr. H. M. Schmidt, technical director of Schomandl KG, Munich, will demonstrate his company's electronic measuring instruments at the research and development laboratories of the Solatron Electronic Group Ltd. at Goodwyns Place, Dorking.

Change of Address

Improved facilities and service relating to the filling and sewing equipment used in conjunction with Palfsacks multi-wall paper sacks are announced by William Palfrey Ltd. These improvements follow the move of their associated company Thames Sack and Bag Co. Ltd., which markets this equipment, to premises adjacent to William Palfrey Ltd. of 24 City Road, London EC1.

The address of the Lead Development Association and that of its affiliated section, formed to promote the activities of the now dissolved Lead Sheet and Pipe Council, is now 18 Adam Street, London WC2. Telephone Whitehall 4175.

The address of the chemical plant division of George MacLellan and Co. Ltd. is Maryhill, Glasgow NW. Tel. MARyhill 2255/9. Telegrams: Caoutchouc, Glasgow.

The sales office of United Coke and Chemicals Co. Ltd. has been moved to the Orgreave Works and the address is now PO Box 136, Handsworth, Sheffield 13 (Sheffield 63025).

Appointed UK Agents

Melanoid Ltd., Dudley Port, Tipton, Staffs, have announced that Griffiths Bros. and Co. (London) Ltd., Armour Works, Well Lane, Wednesfield, Staffs, have been appointed sole selling agents for Melanoid bituminous paints in the UK from 1 October.

Imperial Chemical Industries paints division, will continue to market Melanoid bituminous paints and Tectal cordage and wood preservatives in overseas markets.

Plastics Moulding Dies

Some developments whereby plastics are stated to enable a substantial saving to be made in the replacement of costly dies and tools by relatively cheap castings for the plastics mouldings, were shown by John Harper, of Willenhall, at a one-day conference at their works on Tuesday.

FOR YOUR DIARY

MONDAY, 7 OCTOBER

Institution of Chemical Engineers—London; Council Chamber, Federation of British Industry, 21 Tothill Street, SW1. 5.30 p.m. Papers, 'The effect of temperature on bursting discs' by H. R. Wright, 'The effect of temperature on bursting discs' by T. B. Philip and 'The effect of operating temperature on bursting discs' by J. W. F. Brown.

TUESDAY, 8 OCTOBER

Institute of Metals—Swansea; Dept. of Metallurgy, University College, Singleton Park. 6.30 p.m. Paper, 'Pure metals' by J. C. Chaston.

Society for Analytical Chemistry—Birmingham; Mason Theatre, The University, Edmund Street, 3. 6.30 p.m. Paper, 'Analytical methods in clinical biochemistry' by H. Varley.

WEDNESDAY, 9 OCTOBER

Institute of Fuel—London; Institution of Civil Engineers, Great George Street, SW1. 10 a.m. Symposium, 'Flames and industry', in conjunction with the British Flame Research Committee of the International Flame Research Foundation.

Royal Institute of Chemistry—Isleworth, Middlesex; Grammar School, Ridgeway Road. 7 p.m. Paper, 'Colour' by H. H. Sumner.

SAC Biological Methods Group—London; 'The Feathers', Tudor Street, EC4. 6.30 p.m. Discussion, 'Biological standards'.

SCI Corrosion Group—London; 14 Belgrave Square, SW1. 6.30 p.m. Paper, 'The corrosion resistance of titanium' by J. B. Cotton and H. Bradley.

THURSDAY, 10 OCTOBER

Royal Institute of Chemistry—Brighton; Technical College. 6.30 p.m. Paper, 'Biochemical Research in relation to insect control, by F. P. W. Winteringham.

Market Reports

GOOD INTAKE AGAINST CONTRACTS

LONDON The flow of new business on home account has remained quietly steady and there has been a good intake against contracts. Export demand continues satisfactory, mainly for Commonwealth destinations. Most of the routine potash and soda products have been in good call, while an active interest has been in evidence for borax, boric acid, hydrogen peroxide and formaldehyde. Prices generally continue at recent levels there being no outstanding changes.

There has been no new feature in the coal-tar products market.

MANCHESTER Traders on the Manchester chemical market during the past week have reported a fair contract movement of heavy chemicals to the textile and allied industries and the demand from most other industrial outlets has been on reasonably steady lines, while the call on expert account has been about maintained at its recent level. Except for continued uncertainty in the non-ferrous metal compounds prices generally are on a firm basis. In several sections of the fertiliser market current buying is on steady lines, but otherwise business is described as moderate.

GLASGOW Business during most of the past week in the Scottish heavy chemical market has been steady, and demands have covered more or less the usual range of chemicals, with emphasis on those for immediate requirements. Prices generally have remained firm.

The fertiliser position continues quiet, while export demands remain at a good level.

People in the News

(*continued from page* 567)

MORTON in the chair of textile technology at the Manchester College of Science and Technology. Mr. Vincent graduated in mathematics at University College, London, and after obtaining his M.Sc. joined the staff of the Shirley Institute in 1929. DR. D. G. DRUMMOND, who joined the Institute in 1934 as research assistant in the Rayon Department, has been appointed electron microscopist at Sydney University, Australia. He graduated in physics at Durham University in 1931 and did post-graduate research work at the University College, Newcastle-upon-Tyne. He is now chairman of the electron-microscopy group of the Institute of Physics. First occupant of the new chair of Textile Technology at Glasgow University is also a former Shirley man, MR. R. MEREDITH, who is a graduate of Manchester University where he gained a 'first' in physics. He became a fellow of the Institute of Physics in 1952 when he took up an appointment as senior lecturer in the department of textile industries of the Manchester College of Technology. In 1954 he was awarded the Warner Medal of the Textile Institute.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s. 3d. including postage; annual subscription £8.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period

AMENDED SPECIFICATIONS

On sale 30 October

Sulphonation of alkyl aryl hydrocarbons. Lever Bros. & Unilever, Ltd. **669 899**

Liquid synthetic detergent compositions. Colgate-Palmolive-Peet Co. **708 000**

Steroid substances. G.N.R.D. Patent Holdings, Ltd. **761 009**

On sale 6 November

Treatment of polyamide fibres with per compounds or per compound containing detergent compositions. Deutsche Gold-Und Silber-Scheideanstalt Vorm. Roessler. **767 025**

ACCEPTANCES

Open to public inspection 6 November

Weather resistant light-colour composition containing butyl rubber. Esso Research & Engineering Co. **786 016**

Cyclopentanopoly - hydrophenanthrene compounds. Merck & Co., Inc. [Divided out of 785 681.] **785 683 785 684**

Steroid compounds. Merck & Co., Inc. [Divided out of 785 682.] **785 685 785 686**

Preparation of hydroabietyl alkylene diamine compounds. Abbott Laboratories. **786 018**

Biocidal compositions. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **785 869**

Process for producing solid chloroparaffins. Imhausen Werke Ges. **785 969**

Cyclopentano-phenanthrene derivatives and process for production thereof. Syntex Soc. Anon. **786 019**

Inhibitor for lubricating oil compositions. Esso Research & Engineering Co. **785 970**

Organopolysiloxane nitriles. Midland Silicones, Ltd. **786 020**

Preparation of purified concentrates with intrinsic factor activity. Organon Laboratories, Ltd. **785 972**

Werner type complexes and compositions containing the same. Du Pont De Nemours & Co., E. I. [Divided out of 776 156.] **785 784**

Hydrocarbon drying oil production. Esso Research & Engineering Co. [Divided out of 785 703.] **785 704**

Open to public inspection on 13 November

Water plastic paint. Elliott, A. G. **786 190**

Lubricants and hydraulic fluids. Douglas Aircraft Co., Inc. **786 351**

N-substituted sulfams. Ruhrchemie AG. **786 058**

Morphine derivatives. Merck & Co., Inc. **786 156**

Chromonyl-3-(4¹-hydroxycoumarinyl-3¹) - acetic acid derivatives and compositions containing them. Spota, Spojone Farmaceuticke Zavody, Narodni Podnik. **786 065**

Extraction of organic hydroperoxide. Distillers Co., Ltd. **786 340**

Pigment compositions. Imperial Chemical Industries, Ltd., Smith, R. Deverell,- l'Anson, E., Mellor, J., and Twitchett, H. J. **786 158 786 159**

Preparation of basic oil-soluble polyvalent metal salts of organic acids and solutions of said basic salts in oils, and the resulting salts. Shell Research Ltd. **786 167**

Apparatus for use in quantitative chemical determination processes. Central Electricity Authority, and Potter, E. C. **786 272**

Process for the manufacture of light-sensitive photographic materials. Imperial Chemical Industries, Ltd. [Addition to 718 404, and 750 201.] **786 274**

Photographic emulsions. Imperial Chemical Industries, Ltd. **786 168**

Photographic sensitisers. Imperial Chemical Industries, Ltd. **786 169**

Organic copolymers. Du Pont De Nemours & Co., E. I. **786 344**

Fertiliser compositions. Fisons, Ltd. **786 275**

Copolymers. Du Pont De Nemours & Co., E. I. **786 345**

Process and apparatus for the decomposition of alkali metal amalgams. Solvay et Cie. **786 209**

Detergents and other compositions. Monsanto Chemicals, Ltd. **786 285**

Manufacture of catechol. Distillers Co., Ltd. **786 341**

Manufacture of polytetramethylene terephthalate. Imperial Chemical Industries, Ltd. **786 356**

Chemical nickel plating process. General American Transportation Corp. **786 174**

Production of alkali-metal hyposulphites. Dominion Tar & Chemical Co., Ltd. **786 212**

Polystyrene compositions with high impact tenacity and notch impact tenacity. Newby, H. (Chemische Werke Hüls AG). **786 087**

Diamines and salts thereof. Allen & Hanburys, Ltd. **786 215**

Purification of adiponitrile. Imperial Chemical Industries, Ltd. **786 093**

Preparation of metal gluconates. Pfizer & Co., Inc., C. **786 288**

Phosphate compositions, production and use. Monsanto Chemical Co. **786 094**

Polyester films and their production. Du Pont De Nemours & Co., E. I. **786 176**

Preparing salts and esters of N-substituted terephthalamic acids. California Research Corp. **786 295**

Low-temperature separation of air. British Oxygen Co., Ltd. **786 296**

Gelling hydroxyl polymers. Du Pont De Nemours & Co., E. I. **786 346**

Manufacture of organic chemical compounds. Kodak, Ltd. **786 223**

Catalytic cracking of hydrocarbon oils. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **786 358**

Low temperature methods for preparing high melting point greases. California Research Corp. **786 103**

Unsaturated polyene compounds. Eastman Kodak Co. **786 104**

Olefin oxides. National Research Corp. **786 301**

Production of phenols. Imperial Chemical Industries, Ltd. **786 106**

Amino derivatives of acrylic and methacrylic acids. Rohm & Haas Co. **786 109**

Producing lower alcohols and ethers. Aktieselskabet De Danske Spritfabrikker. **786 303**

Compositions for the culture and protection of crops. Dow Chemical Co. **786 304**

Refining of petroleum hydrocarbons. Compagnie Francaise De Raffinage. **786 225**

Isomerising dialkyl benzenes in the liquid phase. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **786 305**

Purification of high molecular weight alkyl-aromatics. Chemische Werke Hüls AG. **786 112**

Glutamic acid derivatives and process of making same. International Minerals & Chemical Corp. **786 226**

Enrichment in P_2O_5 of phosphate rock which contains calcium carbonate and for the manufacture of superphosphate. Israel, State of, and Perlmutter, S. **786 228**

Method of introducing additives into molten metals. Nielsen, F. **786 229**

Anhydrous crystalline borate, producing same. Borax Consolidated Ltd. **786 308**

Preparing epoxidised condensation polymers and the resulting products. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **786 116**

Process and nutrient medium for producing penicillin. Standard Pharmaceutical Works, Ltd. **786 117**

Unsaturated alcohols and a process for the manufacture thereof. Hoffman-La Roche & Co., AG., F. **786 349**

Resinous compositions. Velsicol Chemical Corp. **786 118**

Unsaturated ketones and a process for the manufacture thereof. Hoffman-La Roche & Co., AG., F. **786 350**

Polymers and their uses. Du Pont De Nemours & Co., E. I. **786 119**

Preparation of zinc and cadmium selenides and tellurides. Du Pont De Nemours & Co., E. I. **786 310**

Process for flushing substances such as pigments. Dehydag Deutsche Hydrierwerke, Ges. **786 312**

2:5-Dioxopyrrolidine-4-propionic acid derivatives. Merck & Co., Inc. **786 124**

Bis-mercaptomethyl aromatic compounds. Esso Research & Engineering Co. [Addition to 783 546.] **786 178**

Removal of alkali metal catalyst resiues from hydrocarbon polymers. Esso Research & Engineering Co. **786 127**

Substituted ureidocoumarin compounds and their use. Geigy AG., J. R. **786 234**

Process for the germicidal treatment of liquids. Rott, H. G. **786 235**

Phenylalkylamines and process for their production. Chemische Fabrik Promonta Ges. **786 128**

Method and apparatus for filling open mouth receptacles. Carter, C.F. **786 368**

Preparation of hydrogen peroxide. Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. **786 237**

Selenium rectifier. Standard Telephones & Cables, Ltd. **786 314**

Preparing carbonaceous material. Great Lakes Carbon Corp. **786 207**

Composite catalysts for use in the hydration of olefins and to the preparation of alcohols thereby. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **786 238**

Production of polymerisation products. Heraeus Ges., W. C., and Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. **786 315**

Purification of methylnaphthalenes. Du Pont De Nemours & Co., E. I. **786 243**

Substituted cyclopentyl compounds. Cassella Farbwerke Mainkur AG. **786 135**

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